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Electrical World

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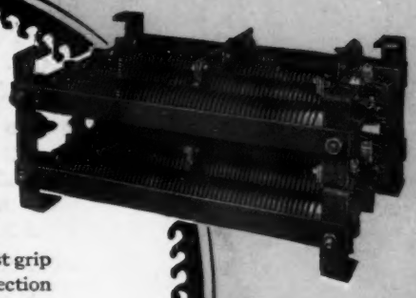
Clamp used for taking off taps. These clamps may be placed at any desired point along the resistor and adjusted at will.

Perfect taper ~and adjustable, too!



TAPS may be placed at any point on the helical winding of Monitor Edgewound Resistors and moved at will, thus enabling the resistance steps to be tapered accurately in any desired manner.

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Simple forms of clamps provide facilities for taking off taps and for joining together the individual resistor units.

These clamps take a powerful and fast grip on the ribbon, giving an electrical connection which will not work loose in service.

There are many other features of the Monitor Edgewound Resistor in which you will be interested—in fact, it beats cast-iron on every count. Ask for Bulletin 107 which describes the Monitor Edgewound Resistor in detail.

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The Original "Just Press a Button" System

Monitor Edgewound Resistor

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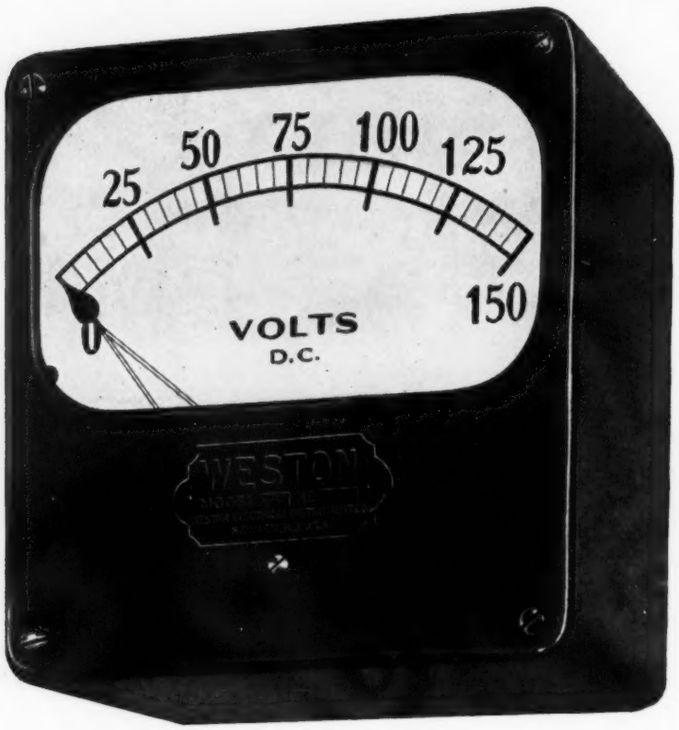

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Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

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McGRAW-HILL COMPANY, INC.
Tenth Ave. at 36th St., NEW YORK, N. Y.

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Cable Address "Machinist, N. Y."
The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Chile and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.

Change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Publishers of
Engineering News-Record — American Machinist
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Radio Retailing
Industrial Engineer — Journal of Electricity
(*Published in Chicago*) (*Published in San Francisco*)
American Machinist—European Edition
Published in London

Copyright 1925
By McGraw-Hill Company, Inc.

Published weekly
Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.
Circulation of this issue, 19,600

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.

A Resolution

THE following resolution has been passed by the Electrical Board of Trade of New York City:

> Whereas our members are frequently solicited with a view of having them purchase advertising space in local programs, association organs, special editions and other publications issued by organizations not regularly engaged in the publishing business, now, therefore,
>
> Be it resolved, that the Board of Governors of the Electrical Board of Trade of New York, Inc., is firmly opposed to advertising in such publication as an economic waste and unjustifiable charge against the cost of doing business, and directs that members shall govern themselves accordingly.

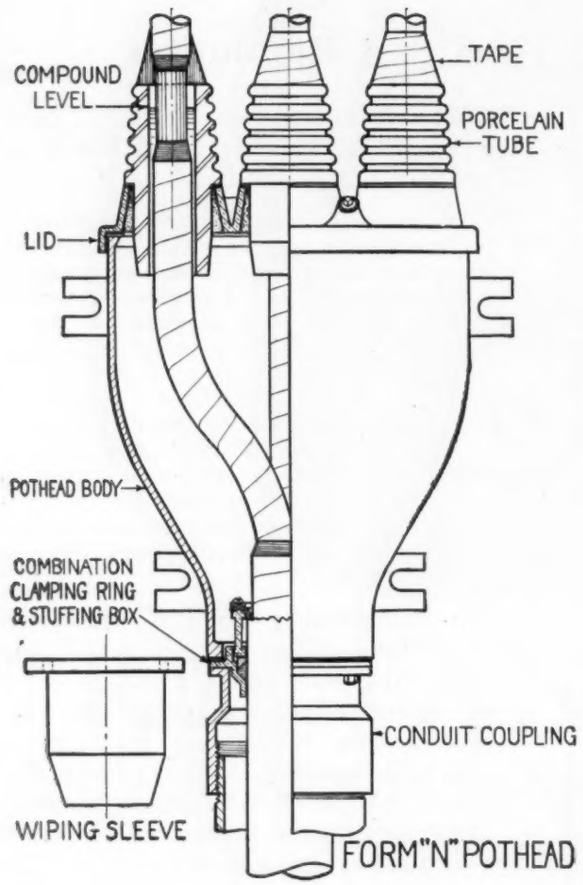
In commenting on this resolution the bulletin of the Board of Trade says: "Any one who advertises in a publication which he believes has no value as an advertising medium is party to a humbug." This is certainly putting it bluntly, but not too much so.

Every electrical man who advertises in a publication goes frankly before the electrical industry and says: "I believe in this magazine. I believe it is editorially helpful to the industry and that it has established itself as a marketplace in which electrical products should be exhibited. It proffers an audience that it is profitable to address." His advertisement in that publication gives counsel to that effect, and many follow his advice.

Viewed from this angle, what an indorsement is read in the advertising section of the Electrical World! Such testimony given week after week and stretching back for more than fifty years into the past bespeaks a service that no other publication in the electrical industry and few in any industry can parallel.

Advertising Index—Alphabetical, 102; Classified, 96, 98, 100; Directory of Engineers, 42, 43; Searchlight Section, 44-52

INSIDE YOUR PLANT



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A simple design takes care of every requirement. There are no unnecessary parts—yet no point in the sealing of a lead cable end is overlooked.

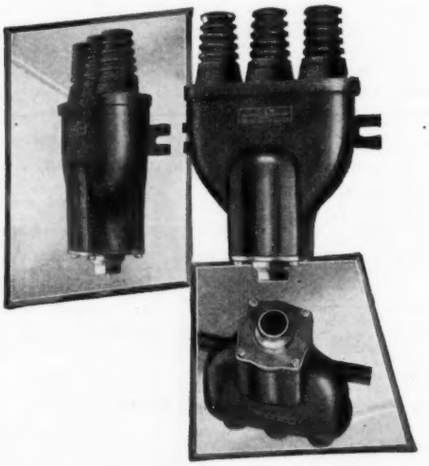
The cable entrance at the bottom of the pothead drawing is standard equipment. This combination entrance provides the same advantages as the wiping sleeve. No lead wipes are required—any electrician can install it. The steam packing at the bottom of the cable entrance prevents compound leakage. The lead sheath is belled over and clamped about one and a half inches above the packing. This distinctive feature not only furnishes the cable bond, but allows one and one half inches of compound contact with the lead sheath below the clamping point. Any cracks developed in belling over the lead sheath will be thoroughly sealed. No moisture can get past that inch and a half of compound.

A heavy rubber gasket under the lid allows the compound to be brot up into the tubes. The insulation on the individual conductors is also brot up into the tube. This increases the safety factor of the installation.

A portion of each conductor is bared and tinned solid, near the upper end of the tubes. The end of the insulation is sealed under compound. Tinning the conductor solidly together prevents any moisture from seeping down between the strands.

A cone of tape on top of the tubes finishes off the job and prevents dust from collecting on top of the compound. The G & W Form N pothead adequately seals any cable inside your plant.

There are eight shapes in the Form N which permits you to take care of any cable terminal condition—at the switchboard—the bus structure—anywhere in your plant.



FORM N—SHAPE C

G & W ELECTRIC SPECIALTY CO.
7780 DANTE AVE. CHICAGO, ILL.

Electrical World

Published by McGraw-Hill Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 86 — *New York, Saturday, September 12, 1925* — NUMBER 11

Fall Convention Season Starts

ELECTRICAL men are now busily engaged in conducting or attending conventions. In all parts of the country national and regional meetings are scheduled and good programs are in prospect. Vacation periods are over and the summer construction work is nearing completion, so that September and October are ideal months for electrical gatherings.

Very largely the regional or group convention predominates in the fall, and this development is a worthwhile addition to convention activities. The larger electrical organizations have developed the national convention until there is little room on the program for discussion or debate. Formal reports and lectures fill the sessions, and only industry-wide topics are treated. It is necessary and advisable to decentralize these large conventions to bring full value to the rank and file of the membership.

It is the rank and file in the different regions of the country that get the greatest benefits from small meetings. Intimate contacts are formed, and the big national topics are discussed with reference to local conditions. Many purely regional problems are also placed before the membership for co-operative action. Better and more important programs are being produced each year at all electrical meetings, and electrical men get full value for the time and money spent in these activities. Conventions are the greatest influence in insuring unity and progress in the industry.

Market Analysis Versus "Shotgun" Selling

ONE of the most encouraging signs in central-station commercial activities is the increasing use of industrial and residential surveys to determine the amount of undeveloped business in a given territory and the concentration of sales effort upon those loads or prospects that are most readily obtainable. The value of such market analyses as a means of eliminating waste effort is well recognized by all competent merchants, and the electric light and power business is particularly well adapted to its use.

A specific example of the application of this principle is seen in the study which the Northern States Power Company has made of its residential customers whereby they are classified according to family incomes. The percentage of appliance saturation is then tabulated for each group. From this it has been possible for the sales manager to determine with a very high degree of accuracy in what districts dwell the most likely "prospects" for sales of the higher-priced devices, such as ranges, refrigerators, ironers and so on. By this means more than 50 per cent of salesmen's time, formerly lost in fruitless canvassing, has been saved, to say nothing of other savings in time and money both in sales and advertising expense.

Selective selling based on intelligent market analysis is far more productive of actual results than "shotgun" methods directed broadcast at all classes of customers, regardless of their needs. Theoretically, every family may be a potential buyer of, say, an electric range because some kind of cooking equipment is required, but sales campaigns to be effective should be concentrated upon the true market as indicated by the customer's financial ability to purchase, his need for the merchandise and the degree of sales resistance. The same principle applies equally well to the sale of additional power and lighting loads, for the most profitable business is, generally speaking, that which can be obtained at the least sales cost.

Progress in Radio Research

EXPERIMENTAL results in the field of electrical research are most satisfactory and come most quickly when all the quantities involved can be controlled. Investigations of this character may usually be accomplished entirely within the laboratory, and the importance and reliability of the results largely depend upon the knowledge, experience, skill and equipment of the investigator. There are, however, many types of problem in which the quantities involved are not subject to control. In this case study is largely limited to observations over a longer or shorter period of time, and the results must be based largely on inductive reasoning and often may be entirely speculative in character. In this class of problem are to be found the great natural electrical and magnetic phenomena, such as the earth's magnetism, gravitation, atmospheric electricity, etc.

Partaking somewhat of the nature of this latter class are the studies which have been under way now for a number of years on the variation in the strength of radio signals as dependent upon the period of the day and year and on the nature and the influence of static disturbance on the transmission signals. Obviously these phenomena are entirely unknown and beyond control, and it is therefore of very great interest to find that certain definite conclusions are now evident as based on the extended series of observations referred to and of which some account is given in an article on "Transatlantic Radio-Telegraph Transmission" in a recent number of the *Bell System Technical Journal.* In these studies quantitative values are given to the strength of the received signal, and also to the strength of the incoming static, by comparison with definite local signals introduced at the receiving station. The signal received is expressed in terms of field strength, and the static is studied over a wide range of frequency by means of filters.

As based on observations extending over two years, it appears that both the diurnal and seasonal variations in the signal field are due to solar radiation. Definite correlation has been found between abnormal radio

transmission and disturbances in the earth's magnetic field. A definite relation has been found between the high night-time value and also the normal daylight value of signal field and the distance of transmission. The major source of long-wave static is indicated to be of tropical origin. Static noise is lower at the higher frequencies, and the night-time and daytime variations with the frequency have been obtained. The effect of static in interfering with signals has been found to be generally similar on both sides of the Atlantic. Marked advantages for the directional receiving wave-type antenna are also indicated. While these results cannot be said to throw any great light on the ultimate nature of the disturbances arising in radio transmission, they nevertheless do give important new information which will enable the radio engineer to predict results and to design equipment with very much greater certainty as to its performance. From the nature of the problems progress is necessarily slow as compared with that from pure laboratory studies, but sustained and persistent work of this character will undoubtedly result in even more intimate knowledge of these stupendous natural phenomena.

Electrolysis of Water Under High Pressure

THE old-new problem of finding an electric load which can be used as a "filler" for valleys in a load curve and disconnected at will has attracted the attention of many able investigators. An obvious tempting field is offered by various electrochemical processes which result in marketable commodities. Unfortunately, there are only a few processes which are at present remunerative and only a few localities where all the necessary conditions of available raw materials, transportation, market and power are "just right." Dissociation of acidulated water into hydrogen and oxygen is one of the earliest electrochemical processes known, but until late years several conditions were not "just right" to make its use on a large scale profitable.

In the first place, there was not enough steady market for hydrogen and oxygen. However, with the changed conditions, enormous quantities of both can now be disposed of. Oxygen is used for welding and in other industrial processes, while hydrogen can be used for heating and cooking, either in place of or as an admixture with illuminating gas. In fact, it is reported to have been conveyed experimentally, for use as fuel, in high-pressure pipes of small diameter over several miles.

In the second place, a theoretical study of energy relations has demonstrated a very low efficiency of electrolytic dissociation of water at atmospheric pressure or thereabout and a subsequent high compression of the resulting gases for transportation. The energy expended for the compression and the necessity of carrying away enormous quantities of waste heat made the whole game not worth the candle. It dawned then on electrochemists and thermodynamicists that electrolysis could be conducted in closed vessels and the liberated gases thus compressed automatically in high-pressure vessels, ready for transportation. Efficiencies of energy conversion may be obtained in this way which compare favorably with those in a lead storage battery.

In the third place, we have the efficient and reliable mercury rectifiers necessary with such a process; we have large economical power plants capable of delivering thousands of kilowatts; we have high-pressure steel tanks and several other important factors which, taken together, should permit a successful exploitation of this process. Considerable research and perhaps one or two experimental plants will be necessary before everything is running smoothly, but there seem to be no insuperable difficulties in the way. The possibility of using excess power right at the power plant whenever convenient and shipping it "canned" certainly should sound alluring enough to lead the operating industry to look carefully into it.

Residence Lighting as a Factor in the Large-Lamp Business

AN INTERESTING view of the importance of residence lighting is obtained from the sales of incandescent lamps. A few years ago residence lighting was considered to be an insignificant field for lamp business and, in consequence, did not stand very well with central-station companies. Of course, those who have followed developments closely have realized the progress in residence lighting, but many electrical men still retain impressions which they gained some years ago.

Extensive and detailed surveys of wiring and lighting in residences have recently made it possible to survey this field with an accuracy which is quite lacking in commercial and industrial lighting. For example, it is now possible to determine very closely many details of residence lighting, including the annual lamp sales. From actual survey data the number of lamps of various wattages which exist in the homes is now known. There are about twenty-two sockets per home, exclusive of attic, closets, exterior and outbuildings, and the total sockets per home average about twenty-six. By utilizing data pertaining to average annual energy consumption it is found that homes consume an average of seven or eight lamps per year. At the lowest list prices now prevailing the weighted average price of lamps in the home is approximately 30 cents. This estimate is based on clear lamps of the lowest list price for each wattage; that is, it does not take into account frosted, round-bulb, white or daylight lamps. In 1924 lamp prices averaged throughout the year approximately 5 per cent higher, so that the weighted average in the home was more like 31.5 cents than 30 cents.

At the beginning of 1924 there were about 11,740,000 wired homes. At seven and one-half lamps per year these accounted for $27,736,000 in lamp sales at lowest prices. During that year 1,528,000 additional homes were connected to central-station lines. These homes required an average of twenty-six lamps each to fill their sockets, and they accounted for $12,514,000 in lamp sales. The additional list prices of round-bulb lamps, frosted, white and daylight lamps increased the total by more than a million dollars, so that the aggregate lamp sales in residences in 1924 was at least $41,250,000. The total sales of large lamps in 1924 for all purposes amounted to approximately $104,000,000. Thus, according to these figures, the residences account for 40 per cent of the total business. These

figures are conservative and some minor favorable factors have been omitted to counteract the effect of a reasonable percentage of vacant and consequently unlighted homes.

Residence construction in the past three years has gone forward at a rapid rate and has greatly outstripped construction for commercial and industrial purposes. Furthermore, in the residential field a great many old homes are wired each year. The result has been that lamp consumption in the residential field has steadily increased from minor proportions to first magnitude. This also is very significant to central-station companies.

The Trend in Sales Department Leadership

WHERE would the automobile industry be today if sales had been left under the direction of the factory superintendent? Here was a product of great possibilities, but in addition to perfecting the mechanism of the car itself, it was necessary to create a popular market. And so some of the finest selling brains in the country were enlisted. Production and sales went forward in balance.

For many years the electric light and power industry was entirely under control of production executives, men whose prime interest was the operation of the plant and the expansion of the system, and scant attention was given to market building. Happily today the trend of our organizations is toward a recognition of the importance of the sales function. Many companies have established vice-presidents in charge of sales and public relations—the latter being, after all, a part of sales, looked upon in other businesses as just the necessary detail of pleasing and caring for the customer. Gradually more authority is being given to the sales executive, and men of broader vision and capacity are being selected to exercise this authority. In other words, the sales department is beginning to take its place in what heretofore has usually been a very one-sided organization.

The problem is still one of men—to secure, in competition with other industries, outstanding sales managers who can more fully and more quickly build up the market for all the applications of electricity. Such men can be obtained and held only by giving them ample opportunity for achievement and for personal prosperity—which means ample authority and generous compensation.

Practical Uses of X-Rays

ALMOST any one connected with this or that industry hears of a practical application of X-rays, not to speak of their use in medical diagnosis. It is therefore of interest to read a fairly complete list of applications, prepared by an expert. According to L. Southerns ("Electricity and the Structure of Matter," published by H. Milford), not only can such obvious things as fractures and the presence of foreign bodies, such as bullets and fragments of shrapnel in war time, be accurately located; but various diseases of the bone can be detected, and abnormalities of the heart and some other organs which, owing to their somewhat greater density than the other tissues, are capable of throwing shadows can be noted. The digestive system can be examined and the passage of food watched if carbonate of bismuth or some other substance opaque to the rays is mixed with the meal. The rays are extremely valuable in the diagnosis, especially in its earliest stages, of tuberculosis of the lungs—a condition which gives rise to a reduction in the transparency of the tissues affected.

The applications of X-rays to industrial and other purposes, as recounted by Mr. Southerns, are numerous and varied in the extreme. The more penetrating rays are used for the detection of defective welds in steel plates and internal flaws in metal generally. Unevenness in the distribution of the component metals in an alloy can be detected; likewise faults in construction of hidden parts of metal or wooden structures. The contents of packing cases have been checked (without opening them, of course), the cores of golf balls examined, oysters searched for pearls without opening the shells, false jewels differentiated from genuine ones (the transparency to the rays being different), moths detected in tobacco destined for the manufacture of cigars, fresh eggs distinguished from stale, the interior of fossils examined, the internal structure of living plants observed, "fake" old masters and antiques exposed and ancient manuscripts and palimpsests examined.

The first discovery of X-rays by Dr. Roentgen was epoch-making. The improvement during the past thirty years has been a result of patient research. The scientific importance of X-rays has kept pace with their practical utility, and much of our present knowledge of the internal structure of the atom is based upon its behavior towards X-rays.

Make Radio Another Standard Household Electric Service

THE power company is sooner or later bound to be head over heels in radio. Some thirty-six types of battery eliminators are already on the market and they will eventually be in universal use. The receiving set will be plugged into a baseboard outlet like a table lamp. Radio will become more and more a public service—both through the wider range of high-powered broadcasting and because it will be taking its power supply from a public utility. And as radio comes on the central-station lines as a load it will be logical merchandise for the power company to sell. So before very long we shall find radio sets on display in every electric light company's salesroom and customers looking to the company for guidance in its purchase.

This will bring many benefits. Radio is the only application of electricity that is vocal—human. Radio is popular. It interests and appeals to everybody—young and old. It will be another friendly contact with the home. It will help public relations. Moreover, it will attract more traffic into the power company's store and increase the sale of all appliances. And the retailing of radio itself will pay good profits to the merchandising department.

Undoubtedly the sale of radio by the public utility will be a good thing for the entire radio industry. For the central station will lend a powerful influence to help make radio an accepted standard household service, like light.

Sears Byron Condit

Pioneer and master builder in the electrical manufacturing field

FROM its earliest days the electrical industry has had the surpassing privilege of development at the hands of men of exceptional vision, enthusiasm and courage. Insight into its technical problems combined with executive ability, sound judgment as to markets and willingness to support these qualifications with capital have marked the successful manufacturer. When the name of Sears B. Condit is spoken in gatherings of electrical men, these characteristics are accepted as a matter of course, and it is to his distinguished record as a pioneer and leader in the vital field of oil-circuit-breaker development that engineers most frequently refer. Founder and president of the Condit Electrical Manufacturing Company of Boston, Mass., for more than a quarter century Mr. Condit's constructive influence in circuit-breaker engineering and production, in the manufacture of fuses, in marketing electrical products and in the councils of the industry has been powerful and valued.

Mr. Condit was born at Somerville, Mass., in 1872, and after leaving school became connected with the Boston Heating Company, under the presidency of the late Theodore N. Vail, who was developing a central-station heating business with this organization. For a short time Mr. Condit was with the C & C Motor Company, at Boston, and in 1892 he became associated with the Massachusetts Electrical Engineering Corporation, later reorganized as Stone & Webster. He helped establish the Chase-Shawmut Company, managing it for a time under Stone & Webster, becoming its selling agent and, more recently, under independent ownership, its president. He is also head of the S. B. Condit, Jr., Company, a widely known manufacturers' agency of Boston. In 1899 he laid the foundation of the Condit manufacturing organization in the building of switchboards and switch gear. He was one of the first to realize the advantages of oil in electrical protective devices, bringing out a complete line of oil switch gear in 1900.

Besides being president of Condits Company, Ltd., the Canadian branch of his organization, Mr. Condit is vice-president of the Associated Manufacturers of Electrical Supplies and is a member of the Electric Power Club, the Electrical Manufacturers' Club and others. He takes deep interest in employee welfare, and the new factory quarters at Hyde Park will house many workers who have literally grown up with the company.

Industrial Electric Heat

Survey of Possibilities and Record of Installation—How to Design Furnaces and Ovens—How to Determine Connected Load—Typical Installations and Sample Calculations

By C. P. YODER
Power Sales Engineer Erie County Electric Company, Erie, Pa.

THE successful application of electricity to small heating devices and the advent of the nickel-chrome alloys as satisfactory heat generators started the development of large installations for industrial purposes. One of the first of these was a Japan baking oven having 275 kw. installed capacity at the plant of the Willys-Overland Company, Toledo, Ohio. The success of this installation induced other automobile manufacturers to turn to this form of heat. The pioneer plant has at the present time more than 14,000 kw. capacity in baking ovens, and thousands of kilowatts for oven heating are installed in automobile and other manufacturing plants about the country. During the war the demand for steel products having uniform and accurately controlled physical properties caused many manufacturers to turn to the electric furnace as a means of producing these results.

The foundation has been placed for an industry that has developed with unprecedented rapidity. Far-sighted engineers predict that the industrial heating load not only will surpass the lighting load but will in time equal or even exceed the present motor load.

The electric generation of heat may broadly be classified under three headings: Metallic resistor, electric arc and magnetic induction. Each of these divisions may be further subdivided according to the particular application for which they are intended.

The applications of the metallic resistor as a source of electrically generated heat may be divided into three rather broad groups, designated as unit applications, oven applications and furnace applications.

Unit Applications of Metallic Resistors

Examples of this type of heater are the small cartridge units, space heaters of various sizes and shapes, immersion heaters and various other types designated by trade names applied by the various manufacturers. In general, these are standardized by the manufacturers, for convenience in manufacture, as to size and wattage, although practically any size, shape and capacity may be made to suit special applications. They range in size from the small cartridge units of 50 or 75 watts, ½ in. in diameter by 2 in. long, to large cast-iron protected units of several kilowatts for lead and babbitt pots and for heavy duty ranges for hotels and restaurants.

The fact that these units may be located just where the heat is required, in the quantity that is desired, and that the temperature can be accurately controlled, has appealed strongly to all users of process machines requiring heat during manufacture. In general the temperatures required from these units do not exceed 400 deg. or 500 deg. F., but there is no reason why, in special applications and when properly designed, they may not produce temperatures up to the maximum limit of the material used.

A few of the uses of these units will illustrate their wide field of application: Process machines—generally small cartridge units where localized heat is desired; cigarette machines—cartridge units 50 watts to 200 watts; doughnut machines—8 kw. per kettle; hospital stills and sterilizers—3 kw. to 30 kw.; water stills for garages—about 10 kw.; oil separators—about 6 kw.; steam ironing machines—600-watt immersion heaters to keep the water hot when machines are not in use; bottle cap machines—600 watts; chemical pipe warmers—200-watt cartridge units in the flanges; autoclaves in chemical plants—units clamped on sides; carbon electrode manufacture—units in molds; roasting cylinders—food products; laundry machines—collar ironers, 600 watts, flat work ironers up to 120 kw. This list could be carried on indefinitely, but these are given to indicate the wide variety of uses to which these units may be applied.

As in all other forms of electric heat, the cost of operating the unit applications compares favorably with other forms of heat. This, however, is not the chief consideration. The fact that just the right amount of heat can be produced in the exact place desired makes for improved working conditions, decreased fire hazard, especially in certain process machines, and in certain cases makes possible operations hitherto impossible.

An interesting special application to large tanks was made by one manufacturer who requires impregnating tanks for armature coils. It is a common practice to heat these tanks by steam, with the usual temperature variations due to fluctuations in the steam pressure.

Three tanks, 8 ft. in diameter by several feet deep, were equipped with clamped on units in five rows about the tanks. Nine inches of insulating material is provided on the outside, and so sure are the engineers of the continued life of the installation that no provision has been made for renewing the elements. The tanks have now been in operation for more than eighteen months, running twenty-four hours per day, seven days per week. It was originally estimated that it would cost approximately $4,000 per year to operate the three tanks. The actual cost was found to be $2,100 per year, as compared with $1,800 for steam. To compensate for this difference it was found that special wrappings costing five cents per coil, necessary in the steam-heated tanks to keep the coils in shape, could be eliminated.

A recent installation of cast-iron protected immersion heaters in the type metal pots of a large Eastern newspaper has proved very satisfactory. As it is of vital importance that no breakdown occur in this part of the newspaper plant, this installation has been watched with considerable interest. The fact that a number of units in multiple are installed in each pot

makes replacement easy without interrupting the work, but to date this has not been necessary.

A standardized application of unit heaters may be mentioned as domestic, hotel and restaurant ranges. The former are too well established to require discussion, while heavy duty ranges for hotels and restaurants are finding more and more favor with their users and are being installed in large numbers.

OVEN APPLICATIONS OF METALLIC RESISTORS

Industrial ovens are distinguished from furnaces principally by the fact that the heated chamber is generally of sheet steel construction in place of the usual refractory material used in furnaces. Because of this fact, oven temperatures never exceed 1,000 deg. F. and in reality very few ovens are operated at this temperature. This value of temperature may accordingly be arbitrarily set as the dividing line between oven and furnace construction.

Oven applications are very extensive and their types and mechanical construction are nearly as numerous as the individual applications. To get the highest efficiency from electric heat the oven should be designed for its particular location and use. This fact, while defeating the idea of oven standardization, is of great advantage in heat conservation.

As has previously been stated, the first large oven installation was at the plant of the Willys-Overland Company for japan baking. Aside from the fact that by this means the time of baking was reduced from three hours to one hour, the better quality and uniformity of work, better working conditions and less likelihood of serious explosions of the volatile gases liberated during the baking cycle established the supremacy of the electric oven for this type of work. Other automobile factories soon followed the lead of the Willys-Overland Company. Dodge Brothers of Detroit, who had at this time just completed the installation of thirty gas-heated ovens, added an electric oven with which to experiment. As soon as thorough tests had been made, all of the gas-heated ovens were replaced by electrics, and at the present time this company has more than 14,000 kw. of connected load in japanning ovens.

Probably the most exhaustive tests of electric ovens as compared with gas-heated ovens were made at the plant of the Ford Motor Company. Two identical ovens, one electrically heated and one heated by gas, were tested for eight months. At the end of this time all the evidence was in favor of the electric oven, with the result that thousands of kilowatts of oven load are now installed in the various Ford plants.

On a strictly fuel cost basis the indirect oil ovens are probably the chief competitors of the electric ovens. If this item only is to be considered, considerable study must be given to the type and construction of the electric oven for the particular application, in which case its cost per unit of work may equal or even better that of oil-fired ovens. Some recent continuous ovens are producing from 50 lb. to 60 lb. of material per kilowatt-hour.

In most oven applications either volatile gas or water vapor is given off during the baking cycle. This necessitates some form of natural or forced ventilation, which reduces the efficiency of the oven due to the heat loss through the air currents. To overcome this loss E. F. Collins of the General Electric Company has designed a new type, which he calls a reflex oven. The general outline of this oven is in the form of an inverted V with the heating chamber at the apex. This is a continuous or conveyor type of oven. The work enters at one end and the circulating air at the other. The baked work, passing down the exit incline, gives up its heat to the incoming air and is discharged practically at room temperature. The air, in turn, in passing out of the oven gives up its heat to the incoming work. With proper design the losses due to ventilation in this type of oven should be reduced to a negligible quantity.

Without discussing the particular advantages in each case, some of the other important applications of electric ovens may be mentioned as follows: Core baking, baking cork flooring, bread and pastry baking, armature baking, acid dipped wire drying, chemical drying, baking grinding wheels, cereal baking, porcelain drying, commutator baking.

This list can be considerably enlarged, but enough examples are given to indicate the extensive field of application of the electric oven. In all of the cases cited either the box type or the conveyor type of construction may be utilized, the decision in general resting with the volume of production to be maintained. In the former case the quantity of material per kilowatt-hour of input will vary between 10 lb. and 20 lb., depending upon the kind of work being put through, while in the latter case it may amount to 60 lb. or even more in the reflex oven mentioned above.

The chief advantages of the electric oven over all other forms of fuel-heated ovens are: Uniform temperature, automatic temperature control, reduction of fire and explosion hazards, better quality, duplication of results, reduction of rejects, improved working conditions, elimination of noise, dirt and fumes, elimination of personal element, lower maintenance, as compared with fuel oil equipment, much lower first cost.

FURNACE APPLICATIONS USING METALLIC RESISTORS

As stated previously, for temperatures higher than 1,000 deg. F. the furnace type of construction is required. With the present metallic resistor units a maximum temperature of 2,000 deg. F. cannot safely be exceeded.

Perhaps the greatest field for the electric furnace is in the heat treatment of steel. This includes annealing, normalizing, carburizing, hardening and drawing, and excludes only the hardening of high-speed steel, which requires a temperature of about 2,400 deg. F., or beyond the safe limits for operating chrome-nickel heating units. Furnaces for this work range from small tool-hardening furnaces of 5 kw. capacity to large annealing furnaces 16 ft. x 28 ft. x 8½ ft. high, inside dimensions, and having a connected load of 720 kw.

Since the proper heat treatment of steel requires very close temperature control in order to produce the physical properties demanded, the electric furnace stands supreme in this field. Not only must the temperature be accurately controlled but it must be uniform throughout the furnace. This is practically impossible with any form of fuel-fired furnace, due to the fact that the flame temperature of the fuel cannot be varied and some form of complete or semi-muffling must be resorted to in order to approach uniform temperature conditions within the heating chamber. With the exposed metallic resistor type of electric heater installed directly in the heating chamber and operating

only a few degrees above that required, practically uniform temperature can be maintained throughout. Close and uniform temperature control is of special importance in the heat treatment of dies. It is absolutely necessary that the material be uniformly heated throughout in order to prevent cracking during the quenching operation.

When annealing large and intricate castings, it is also important that the temperature of the heating chamber be absolutely uniform throughout and that the temperature of the source be as near as possible to that of the material. This insures uniform heating of the material and prevents burning of the thin sections.

In carburizing, the time cycle and temperature determines the depth of the case. After the work has been heated to the required temperature, the application of the fireless cooker principle of the electric furnace permits long holding of the heat for deep penetration with a minimum consumption of energy.

Temperature Accurately Controlled and Personal Element Eliminated

In all of these applications the fact that the temperature is automatically controlled, by methods to be mentioned later, entirely eliminates the personal element so necessary in the successful operation of fuel-fired furnaces. Since there is an absence of noise, dirt and excessive room temperature rise, the electric furnace can be located in the line of production instead of in a special heat-treating room, as is customary with fuel-fired furnaces. By taking advantage of this fact, one manufacturer saved $2.35 per hundred gears in transportation and handling charges alone.

On a strictly fuel cost basis the operation of an electric furnace is generally more expensive than when using other forms of heat. But where quality and uniformity of work are of importance, the fuel cost is of small significance. However, if the over-all cost of production is considered, in practically every case the evidence is in favor of the electric furnace. This is due to elimination of labor, reduction of spoilage and elimination of certain operations required where fuel-fired furnaces are used. One manufacturer, hardening gears weighing about 8 lb., could do this work for 1.4 cents per gear in a fuel-fired furnace. It cost 2 cents per gear in an electric furnace, but the substitution of the latter eliminated a cleaning operation costing 4 cents per gear, previously required. Another manufacturer found that, by using an electric furnace for annealing gears, a straightening operation, required when using a fuel-fired furnace, could be eliminated. In the annealing of sheet steel punchings it is generally necessary to pack them in boxes to prevent scaling when using a fuel-fired furnace. By using an electric furnace the boxes may be eliminated. This effects considerable saving in the annealing operation, since the boxes are expensive, of short life, and constitute in general at least 50 per cent of the weight of the charge.

The extremely low maintenance costs of electric furnaces is an important item in considering the over-all costs of manufacturing. Since the extensive use of electric furnaces is of comparatively recent date, there is no accumulation of data to indicate how long an average furnace will last. From the evidence so far obtained it can be confidently predicted that with good design and reasonable care an electric furnace should last indefinitely. One of the first furnaces installed, operating at approximately 1,500 deg. F., has been in daily use for more than seven years. During this time the hearth has been renewed twice because of wear caused by sliding the work in and out of the furnace. Otherwise the furnace is as good as when originally installed. The same record is being maintained by the later furnaces installed.

To turn to other applications of the electric furnaces, the field of vitreous enameling has extensive applications. Since the first commercial application in St. Louis the number of furnaces for this line of work has been constantly increasing. The Crane Enamelware Company of Chattanooga, Tenn., is now doing all of its vitreous enameling electrically. The officials of the company state that in every case their salesmen can pick out an electrically fired bathtub from among a number fired otherwise, due to the superior quality of the finish. One stove company upon installing an electric enameling furnace claims to have reduced the cost of producing enameled ware to one-fourth what it cost to purchase from a jobbing company. Its stove sales have also been increased considerably due to the superior quality and appearance of the material.

The annealing of brass and copper can be more successfully accomplished in the electric furnace than in any other type and, in general, at a reduction in over-all cost. The bright annealing of copper, especially, is a noteworthy application, and several types of satisfactory furnaces are now on the market for this purpose and hundreds are in actual operation.

As a source of heat for glass lehrs, electricity is particularly applicable. Because of the ease and accuracy with which the electric furnace temperature may be controlled it is possible to operate the lehr at a temperature that approaches very closely the critical point of glass. The nearer this temperature is approached the quicker the anneal. Where quality is important, the electric lehr is especially attractive. At the present time the Eastman Kodak Company anneals all lens glass electrically. Electric annealing of glass is not restricted to applications where high quality is the determining factor. The Illinois Pacific Glass Company has installed eight lehrs of 240-kw. capacity each and its production is mainly milk and pop bottles.

Design of Ovens and Calculation of Connected Load

It has been stated that the science of electric industrial heating is about 90 per cent the physics of heat and 10 per cent the physics of electricity. This is undoubtedly true, because, with the exception of the controlling equipment, a knowledge of Ohm's law and familiarity with resistance calculations are all that are necessary to determine the size of heaters. On the other hand, practically all the laws of heat enter into the successful design and application of ovens and furnaces. The successful designer must be able to trace the heat energy as it leaves the electric heater, whether by conduction, convection or radiation, through the cycle of useful work to unavoidable radiation losses and resultant temperature rise of the surrounding air. In this latter case it should be emphasized that modern ovens and furnaces, whenever possible, are now given a coat of white or aluminum paint on the outside. Besides giving a neat and clean appearance to the installation, the radiation losses are reduced sufficiently

to warrant the expenditure necessary to produce the light surface.

One of the first considerations in the design of an oven after its physical dimensions are determined is the provision for sufficient insulation. Since ovens in general operate at low temperatures, the importance of this is frequently lost sight of. Especially is this true with those familiar with the operation of fuel-fired ovens, since in this case the radiation losses are negligible as compared with the unavoidable losses due to combustion and flue gases.

Panel type ovens, while convenient from a construction standpoint, are not satisfactorily insulated, due to the amount of through metal used in their construction. It is good practice to add to the outside some good insulating material.

Red brick ovens, due to their heat capacity, absorb considerable energy during the heating cycle. If they are to be run on an eight-hour or ten-hour-day basis, a course of insulating brick should be provided on the inside. If they are to be used for continuous operation, the insulating brick may be placed on the outside.

When ovens are used for japan baking, core baking, etc., some form of natural or artificial ventilation must be provided. Japan consists of about 80 per cent solvent, which, at 450 deg. F., is driven off in the first fifteen minutes of heating. When combined with the proper amount of air, an explosive mixture is formed. It has been calculated that 1,500 cu.ft. of air per gallon of solvent is required to prevent an explosive mixture; therefore this quantity of air must be supplied by fan or otherwise. When the quantity of solvent is not known, it is considered good practice to allow twenty changes of air per hour. During the baking of cores, water vapor is driven off, and this must be carried away by air circulation. Four changes of air per hour is considered good practice in this case.

In practically all modern installations exposed nickel-chromium ribbons mounted on suitable insulators are used for the heat generator. They are usually made in the form of standardized units, which may be grouped in sufficient numbers to give the heat capacity necessary. Their location should be as low in the oven as possible.

The rating of oven heaters is based on good practice and is determined by the temperature that the work in the oven will stand. It is desirable in most applications to keep the ribbon temperature as near that of the work as possible. A standard unit for expressing the operating condition of the ribbon is the watts radiated per square inch of ribbon surface. The following table gives the ribbon temperatures for various densities when the ribbon is suspended vertically in free air:

Watts per Sq.In.	Deg. C.	Watts per Sq.In.	Deg. C.
1	130	8	410
2	200	16	560
4	295	32	730

One large manufacturer of oven units rates his standard unit at 3.8 kw., 110 volts. This consists of 25 ft. of 0.005-in. x 1-in. nickel-chromium ribbon. At the above rating the ribbon density is 5½ watts per square inch.

One of the most important considerations is a suitable terminal for the ribbon ends. This has been given considerable thought and investigation, and the standard units now procurable are properly provided with this connection.

CALCULATION OF CONNECTED LOAD

There are three main factors involved in the calculation of the connected load: 1. Absorption. 2. Ventilation. 3. Radiation.

Absorption:

$$\frac{W \times S \times T}{3{,}415} = \text{kilowatt-hours}$$

W = Weight of material in oven.
S = Specific heat of material.
T = Temperature difference.
3,415 = B.t.u. per kilowatt-hour.

Ventilation:

$$\frac{V \times W \times S \times T}{3{,}415} = \text{kilowatt-hours}$$

V = Volume of air in cubic foot.
W = Weight of air per cubic foot.
S = Specific heat of air.
T = Temperature difference.

Radiation:

$$\frac{K/t \times T \times A}{3{,}415} = \text{kilowatt-hours}$$

K = 1 for average oven.
t = Thickness of wall in inches.
T = Temperature difference.
A = Total inside area of oven in square feet.

In general 1 sq.ft. of insulation, 1 in. thick, will conduct per degree F., 0.4 B.t.u. per hour. To allow for other variables the value 1.0 is usually used.

To illustrate the use of these formulas a practical example will be considered. A japan oven 8 ft. long, 4 ft. wide, 7.5 ft. high, inside dimensions, is to bake, at 450 deg. F. for one hour, 1,300 lb. of material. Thickness of walls is 4 in. Japan used per bake, 1¼ gal. To determine the connected load:

Absorption:

$$\frac{1{,}300 \times 0.12 \times 400}{3{,}415} = 18 \text{ kilowatt-hours}$$

Ventilation:

$$\frac{6{,}000 \times 0.08 \times 0.23 \times 400}{3{,}415} = 13 \text{ kilowatt-hours}$$

As stated above, 80 per cent of japan is solvent, and at 450 deg. F. this is driven off during the first fifteen minutes. Therefore 1 gal. of solvent is driven off in fifteen minutes, requiring 1,500 cu.ft. of air, or 6,000 cu.ft. per hour. Of course, the fan might be shut off after fifteen minutes and thus reduce the ventilation losses, but this is not considered good practice, as it might not be turned on for the next bake with the possibility of an explosion.

Radiation:

$$\frac{0.25 \times 400 \times 240}{3{,}415} = 7 \text{ kilowatt-hours}$$

Door losses in short ovens are about the same as the total radiation, so that the total calculated energy equals:

Absorption, kw.-hr.	18
Ventilation, kw.-hr.	13
Radiation, kw.-hr.	7
Door losses, kw.-hr.	7
	45

The insulation will absorb a certain amount of heat, which is usually considered as about 15 per cent of the total calculated. Therefore, the total energy required may be stated as 52 kw.-hr. Since this energy is expanded in one hour, the oven should have a connected load of 52 kw.

When making calculations for core ovens, the specific heat is usually taken as $S = 0.2$. This is for the sand alone. The quantity of moisture must be determined, for which additional energy must be supplied at the rate of 1 kw.-hr. per 3 lb. of moisture.

A further discussion of high-temperature applications will be published in a future issue of this paper.

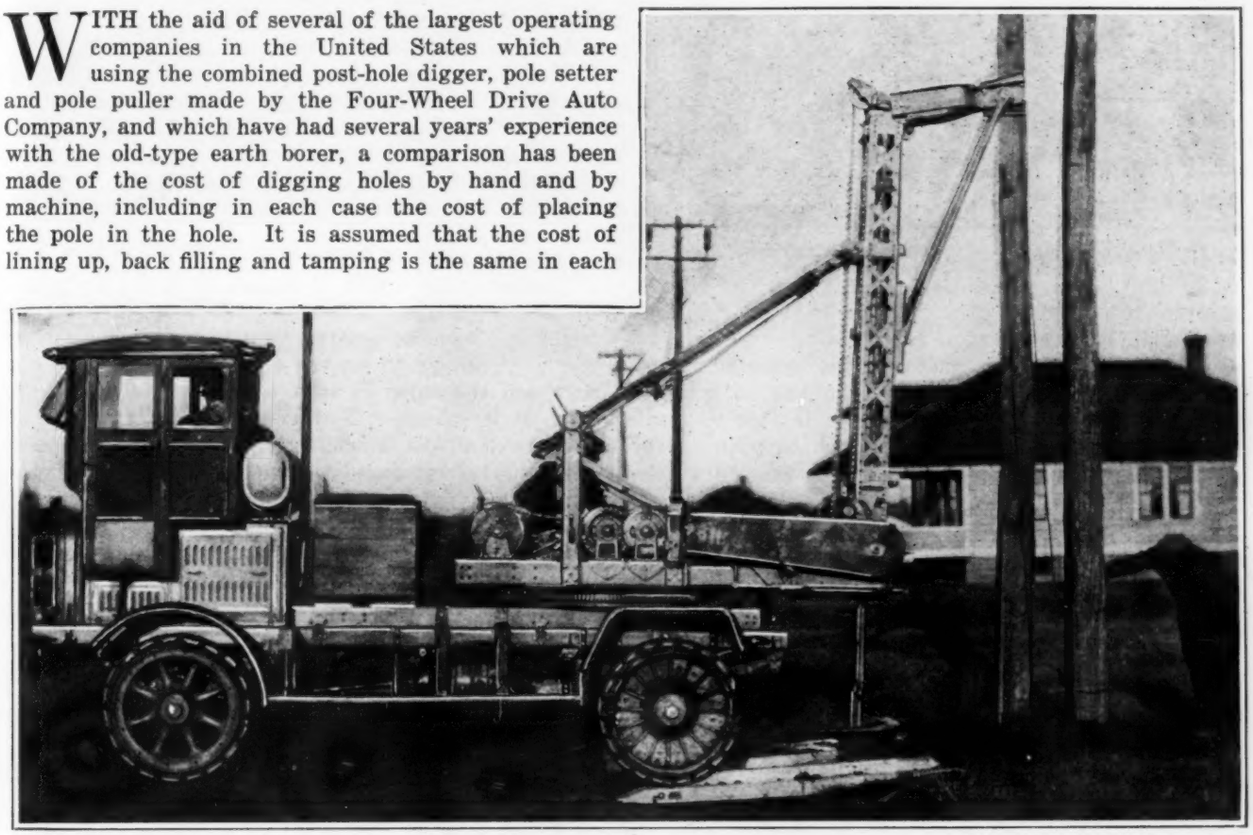
Cost of Pole Setting by Machine

Compared with Cost of Hand Methods of Digging Holes, Setting and Pulling of Poles—Based on User's Experiences—Unit Cost Depends on the Amount of Usage per Year

By R. N. CARTER

Transportation Engineer Four-Wheel Drive Auto Company, Clintonville, Wis.

WITH the aid of several of the largest operating companies in the United States which are using the combined post-hole digger, pole setter and pole puller made by the Four-Wheel Drive Auto Company, and which have had several years' experience with the old-type earth borer, a comparison has been made of the cost of digging holes by hand and by machine, including in each case the cost of placing the pole in the hole. It is assumed that the cost of lining up, back filling and tamping is the same in each case, therefore these costs are not included. Comparisons were made of various kinds of digging, the character of which is indicated by the number of holes one man digs in one day. For the purposes of these comparisons, it is assumed that the machine will bore the number of holes per day indicated in the tables, and these were based on hard digging only. These estimates are conservative, as the machine will, on an average, bore double the number of holes assumed in the cost summary. The analysis of hand operations is shown in Table I.



POLE SETTING MACHINE IN OPERATION

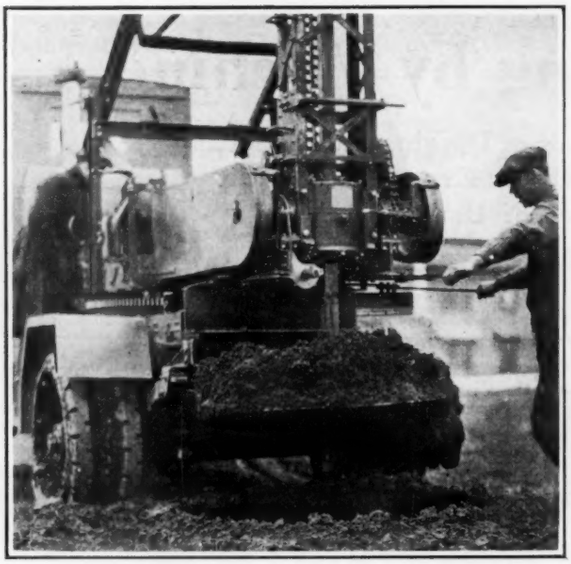
The number of holes that a man can dig in a day by the hand method depends upon the character of the soil and the man, and ranges from one to six a day. But two holes is an average figure per man. Out of a gang of eight men, the foreman and chauffeur do no digging, so that from the efforts for one day the results are twelve holes for such a gang and auto truck. Furthermore, the gang has to be transported with its shovels, bars and other line-construction material to the job in a motor truck. Probably the average time lost in getting to a job is half an hour. After reaching the job fifteen or twenty minutes more is lost getting ready, distributing tools and assigning the men. If no poles are to be set or wire run, the truck will, in all probability, stand practically idle all day.

Using the earth-boring machine referred to, three men are necessary to operate it—one to drive the truck and control the various gear shifts of the machine, one to operate the earth-boring machine and one ground man to assist the machine operator. Because

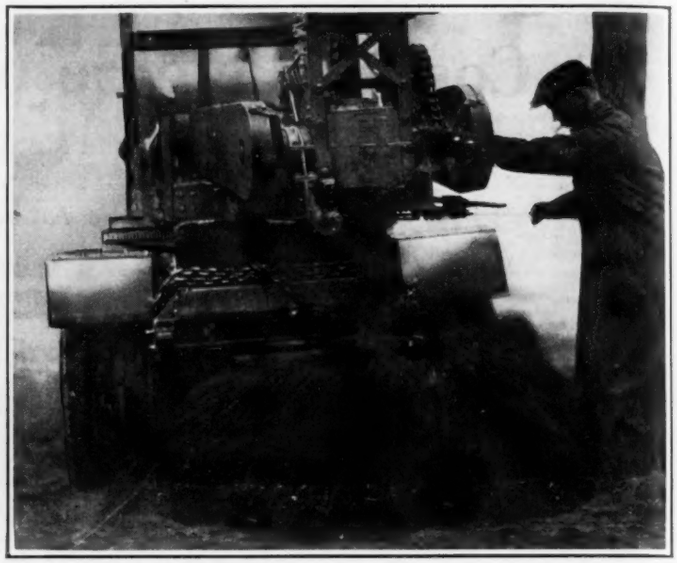
TABLE I—COST OF DIGGING HOLES FOR AND SETTING 30-FT. POLES BY HAND

	No. of Holes Per Man		Per Day	
	1	2	4	6
Average cost per hole @ $4 per day per man	$4.00	$2.00	$1.00	$0.60
Incidentals, 20 per cent of labor cost	.80	.40	.20	.13
Supervision and tool expense, 35% of labor cost	1.40	.70	.35	.23
Total cost digging only	$6.20	$3.10	$1.55	$1.03
Raising by hand (including all loading)	2.00	2.00	2.00	2.00
Total digging and raising by hand	$8.20	$5.10	$3.55	$3.03

Notes: Labor is figured at $4 per day. The cost of the truck which ordinarily accompanies a gang is not included, as a truck is also used to transport the boring machine. Unproductive hours are not included.



RAISING FIRST "BITE" OF EARTH TAKEN BY 48-IN. AUGER



CLEARING AUGER OF EARTH BY CENTRIFUGAL ACTION

of the fact that the truck is driven from all four wheels, it is possible for it to travel over ground seemingly impassable to motor-driven vehicles of any kind. With this ability and by the use of skids to bridge ditches and so on, the driver is able to reach the spots desired and place the truck in position for boring the hole. By the use of the turntable, the auger may be given a wide sweep (180 deg.) and the tower tilted so as to bore a straight hole even though the truck be on very uneven ground. The auger can be swung from one extreme position to the other in fifteen seconds. Slanting holes can be bored for anchor posts. When the truck is in place, the tower is given the desired tilt, the auger lowered and the lever thrown to set the auger in motion. In ordinary soil the auger is sunk to a depth of about 2 ft., when it is raised and by centrifugal motion the dirt is removed almost immediately. This action is repeated until the hole is bored to the desired depth. Twenty 4-in. holes, 7 ft. deep, can be dug in two minutes under ordinary soil conditions. Holes up to 48 in. in diameter can be dug for such purposes as tower footings. By the removal of six bolts, the complete earth-boring equipment can be removed from the truck, thus

TABLE II—COST OF DIGGING 1,000 POLE HOLES PER YEAR BY EARTH BORER

Total Investment:		
Chassis and equipment		$9,000.00
War tax		126.00
Freight		200.00
		$9,326.00
Minus tires		400.00
		$8,926.00
Fixed Charges:	Per Year	
Depreciation, 10 per cent, or 10-year period, $9,326 — $400 tire value	$892.60	
License	85.00	
0.06 plus 0.02 plus 0.005 equals 0.085 per year Interest, taxes and administration, 0.0071 per cent per mo.	$792.71	
Garage	120.00	
Insurance	120.00	
	$1,310.31	$1,310.31
Variable Charges:		
Repair to truck 50 days per year	$50.00	
Repairs to boring machine (50 days)	100.00	
Gasoline and lubricants (20 gal. gas — 1 qt. oil daily — 50 days)	262.50	
New tires	200.00	
Miscellaneous	25.00	
	$637.50	$637.50
Wages and Expense:		
Chauffeur, 50 days @ $6.50 per day	$325.00	
Operator, 50 days @ $6.50 per day	325.00	
Helper, 50 days @ $4.50 per day	225.00	
	$875.00	$875.00
		$2,822.81

$2.882 cost per hole on 1,000 holes per year at twenty holes per day.

TABLE III—COST OF DIGGING 2,000 POLE HOLES PER YEAR WITH EARTH BORER

Total Investment:		
Chassis and equipment		$9,000.00
War tax		126.00
Freight		200.00
		$9,326.00
Minus tires		400.00
		$8,926.00
Fixed Charges:	Per Year	
Depreciation, 12½ per cent, or 8-year period, $9,326—$400 tire value	$1,115.75	
License	85.00	
Interest, taxes and administration, 0.0071% per mo.	792.71	
Garage	120.00	
Insurance	120.00	
	$2,233.46	$2,233.46
Variable Charges:		
Repairs to truck (100 days per year)	$100.00	
Repairs to boring machine (100 days per year)	200.00	
Gasoline and lubricants (20 gal. gas and 1 qt. oil daily)	525.00	
New tires	200.00	
Miscellaneous	50.00	
	$1,075.00	$1,075.00
Wages and Expense:		
Chauffeur, 100 days @ $6.50 per day	$650.00	
Operator, 100 days @ $6.50 per day	650.00	
Helper, 100 days @ $4.50 per day	450.00	
	$1,750.00	$1,750.00
		$5,058.46

$2.53 cost per hole on 2,000 holes per year at twenty holes per day for 100 days.

TABLE IV—COST OF DIGGING 3,000 POLE HOLES PER YEAR WITH EARTH BORER

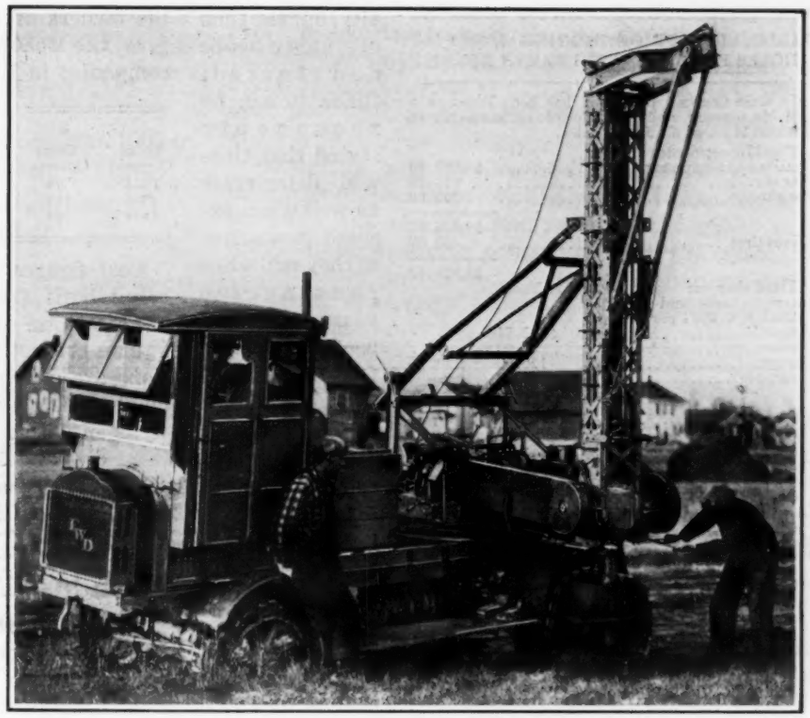
Total Investment:		
Chassis and equipment		$9,000.00
War tax		126.00
Freight		200.00
		$9,326.00
Minus tires		400.00
		$8,926.00
Fixed Charges:	Per Year	
Depreciation, 14¾ per cent or 7-year period, $9,326—$400 tire value	$1,275.14	
License	85.00	
Interest, taxes and administration, 0.0071 per cent per month	792.71	
Garage	120.00	
Insurance	120.00	
	$2,392.85	$2,392.85
Variable Charges:		
Repairs to truck (100 days per year)	100.00	
Repairs to boring machine (100 days per year)	200.00	
Gas and oil (20 gal. gas and 1 qt. oil daily)	525.00	
New tires	200.00	
Miscellaneous	50.00	
	$1,075.00	$1,075.00
Wages and Expense:		
Chauffeur 100 days @ $6.50 per day	650.00	
Operator 100 days @ $6.50 per day	650.00	
Helper 100 days @ $4.50 per day	450.00	
	$1,750.00	$1,750.00
		$5,217.85

$1.74 cost per hole on 3,000 holes per year at thirty holes per day for 100 days

TABLE V—COST OF DIGGING 5,000 POST HOLES PER YEAR WITH EARTH BORER

Total Investment:		
Chassis and equipment		$9,000.00
War tax		126.00
Freight		200.00
		$9,326.00
Minus tires		400.00
		$8,926.00
Fixed Charges:	Per Year	
Depreciation, 20 per cent, or 5-year period, $9,326 — $400 tire expense	$1,785.00	
License	85.00	
Interest, taxes and administration, 0.0071 per cent per month	792.71	
Garage	120.00	
Insurance	120.00	
	$2,902.81	$2,902.81
Variable Charges:		
Repairs to truck, 125 days	125.00	
Repairs to boring machine, 125 days	250.00	
Gas and oil (20 gal. gas and 1 qt. oil daily)	656.25	
Tire expense	200.00	
Miscellaneous	50.00	
	$1,281.25	$1,281.25
Wages and Expense:		
Chauffeur, 125 days @ $6.50 per day	812.50	
Operator, 125 days @ $6.50 per day	812.50	
Helper, 125 days @ $4.50 per day	562.50	
	$2,187.50	$2,187.50
		$6,371.56

$1.27 cost per hole on 5,000 holes per year at forty holes per day for 125 days.



BORING SMALL POST HOLE AT SIDE OF TRUCK

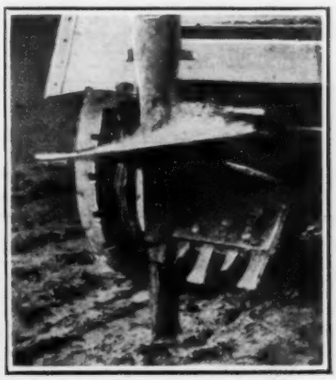
releasing it to be used for other purposes on a utility property.

According to the experience of users, two or three men will do more work in one day with this machine (that is, dig more holes and set more poles) than sixty men can do by hand. The machine can dig the hole, raise the pole, drop it into place, pull the old pole and move on to the next location in less time than a hole 2 ft. deep can be dug by hand.

Holes can be dug with this earth-boring machine in any kind of soil that can be dug by hand methods without blasting. Even shale, which has always been a long job to remove with the shovel, holds no terrors for the earth-boring machine. By using a specially designed auger, a 24-in. hole 7 ft. deep can be dug through the toughest shale in twelve minutes.

A basis for figuring costs applicable to those companies that have only 1,000 holes to dig per year is afforded by Table II. When the machine is required to do only this amount of work, its life in years is lengthened somewhat. In this table the equipment is depreciated over ten years, or a period sufficient to dig 10,000 post holes and set and pull the same number of poles. This is considered very conservative under the circumstances. The interest is figured at 6 per cent, taxes at 2 per cent, with administration of ½ per cent, making a total of 8½ per cent, or approximately 0.71 per cent per month. Garage rental is figured at $10 per month, insurance at $120 per year and the license at $85 per year. Where license charges are different and other rates for insurance and garage rental prevail, these figures should be substituted in place of the ones shown.

With the exception of depreciation, which is taken as 8 per cent, or a pole life of 16,000 poles, Table III is self-explanatory. The variable charges differ somewhat because they are governed entirely by the number of days operated, the only item remaining the same being tire expense. This has been figured very conservatively, since the tire life is usually governed by the number of miles traveled. In either Table II or Table III the miles traveled will be a negligible quan-



SETTING POLE AFTER HOLE HAS BEEN BORED

At left—Four-wheel drive post-hole borer, pole setter and puller negotiating bad roads.

In center—Twenty-four-inch hole in shale bored 7 ft. deep in twelve minutes.

At right—Special attachment on mechanical hole borer for cutting into shale.

TABLE VI—COST OF DIGGING 5,000 POST HOLES PER YEAR WITH EARTH BORER

In these figures depreciation has been listed as a variable expense and the life of an earth-boring machine is based on 30,000 holes.

Total Investment:		
Chassis and equipment		$9,000.00
War tax		126.00
Freight		200.00
		$9,326.00
Minus tires		400.00
		$8,926.00
Fixed charges:	Per Year	
Interest, taxes and administration, 0.0071 per cent per month	$792.71	
License	85.00	
Garage	120.00	
Insurance	120.00	
	$1,117.71	$1,117.71
Variable Charges:		
Depreciation (30,000 pole life) $0.2975 each	$1,487.50	
Repairs to truck (125 days)	125.00	
Repairs to boring machine (125 days)	250.00	
Gas and oil (20 gal. gas and 1 qt. oil daily)	656.25	
New tires	200.00	
Miscellaneous	50.00	
	$2,768.75	$2,768.75
Wages and expense:		
Chauffeur, 125 days @ $6.50 per day	812.50	
Operator, 125 days @ $6.50 per day	812.50	
Helper, 125 days @ $4.50 per day	562.50	
	$2,187.50	$2,187.50
		$6,073.96

$1.214 cost per hole on 5,000 poles per year at forty holes per day.

tity, but the time operated must be considered. Since it can be reasonably stated that tires will deteriorate as well when exposed to weather as they will when running, two years have been used as a basis for the set-up charge on tires, but experience has shown where solid tires have been usable for four years. Two years is therefore considered to be conservative for tire life.

With depreciation figured on a seven-year basis, or a 21,000-pole life, the figures are given in Table IV.

When setting 5,000 poles per year, Tables V and VI apply. In Table V depreciation has been figured on a yearly basis, so this item is shown in a fixed charge account. In Table VI depreciation is figured on the hole basis, using 30,000 holes as the life of the earth-boring machine. Therefore, instead of depreciation showing up under fixed charges, it is listed under the variable charge column, because the total amount of depreciation depends upon the number of holes bored. The rest of the figures are determined in the same way.

While not being permitted to divulge the names of the owners of earth-boring machines, it is possible to give the following authentic figures from operating companies in Wisconsin, Michigan and Illinois:

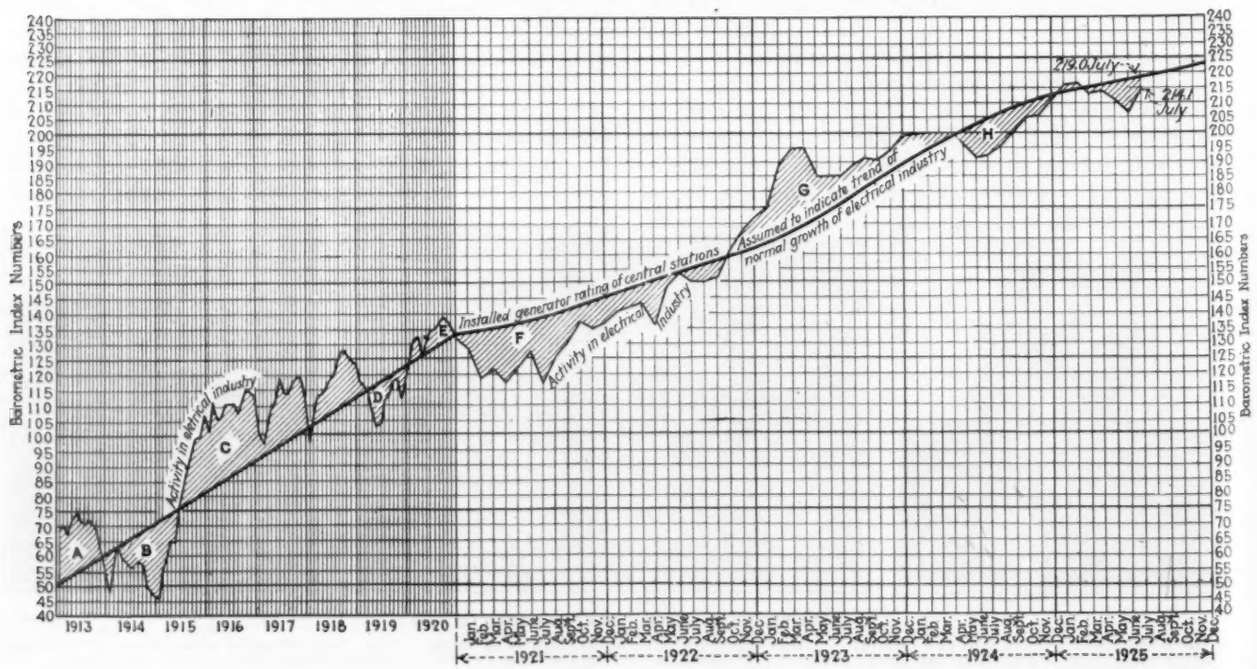
Miles Covered	Days Operated	Poles	Machine Cost	Hand Method Cost	Saving with Machine	Locality	Poles per Day
1068	99	2764	$2.23	$4.56	$2.23	Wisconsin	28
2385	111	2068	3.88	6.72	2.84	Michigan	19
1679	84	1852	3.32	8.33	5.01	Illinois	22

Cost figures will soon be available on a line that is being built from Fort Worth, Tex., to Los Angeles, Cal., a total distance of 1,550 miles. While these figures are not yet available, some reports of the operations are offered. In one day of eight hours, 103 pole holes were dug and 103 poles were set. On another occasion with a dual shift of eight hours each, 170 holes were dug and 170 poles were set. The best record on digging holes alone was made during a dual shift of eight hours each, when 225 holes were dug.

Industrial Activity on the Increase

PRODUCTION figures upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" is based indicate that July witnessed a decided upward trend in the activities of the electrical industry. A number of the primary industries which are considered as barometric indications of general industrial activity, and those used as the basis for activity in the electrical industry, were operating several per cent above the operations reported for June, although most of these industries were operating below the estimated normal for the month.

During July the electrical industry as a whole was operating at 4.9 per cent below the estimated normal for the month. In June it was operating at 6.3 per cent (revised) and in May at 6.6 per cent below normal. Incomplete returns indicate that the electric light and power branch of the industry continued the upward swing it started in June and was operating at approximately 2.4 per cent above the estimated normal during July.



Suggestions for Improving Public Relations

Some Conditions That the Public Does Not Understand on Which Information Should Be Disseminated—What Different Departments Can Do to Win Good Will

By A. P. Singer
Superintendent of Power Memphis Power & Light Company

FEW LINES of business are less understood and more maligned than the public utility. Frequently, the public complains of either the cost or the quality of the service. Ninety-nine times out of every hundred when the electric service switch is pushed, the lamps glow or the motors revolve without the slightest apparent effort or delay. However, should the lamp or motor fail to respond to the closing of the switch on a single occasion, large numbers of people are quite prepared to assert "The service is the very worst I have ever known; my lights are always out, and altogether, the service is bad." When the bill is rendered at the end of the month, they "are quite sure the meter has been arranged to go too fast," and they "do not know what the company does with all the money." All they see or care to know about the service includes the lamps and fixtures in their home. If they do give electric service further thought, they visualize an old building containing some noisy and dirty machinery, which in some way or other is made to send out light over a few wires, strung on unsightly looking poles.

Taken collectively, individuals or the public have no real knowledge of the multitude of detail and amount of skill and effort required before the mere closing of the switch will cause the lamp to glow or the motor to revolve. For instance, how few realize the amount of money invested in a property to buy land, buildings to house the machinery, poles to carry the wires, mains buried in the streets to convey the gas, meters to give both customers and company a square deal, trucks and service cars to aid in maintaining service at as close to 100 per cent as is humanly attainable. Neither does the public realize the amount of time the management of public utilities spends in trying to impress upon the employees of the companies the prime importance of rendering the highest possible service to the public. The services rendered by public utility employees in restoring interrupted service to the public may not be quite as spectacular as the rushing of a high-speed riot car to quell some disturbance, or the fire brigade speeding to an outbreak of fire, but the restoration of service often requires quite as much effort and is no less dangerous to the employees of the company.

Service must be given at all costs; this is the first lesson impressed upon all employees of the company.

Again, does the general public realize how frequently service interruptions are caused by accidents quite beyond the company's control, such as lightning, heavy wind and rain storms, trees falling on lines? Besides these, additional hazards are reported in the form of aërial wires falling over the lines. Probably 99 per cent of service interruptions can be traced to such causes. However, the customer usually gives little thought as to cause or whose responsibility it is; all he is concerned in is the restoration of his service. Therefore it behooves the public utility company to take every precaution to purchase the best of material for the purpose intended and to see that it is installed with every possible degree of skill that can be used, so that even the elements that are beyond control cannot break down efficiency or stability.

Giving the best possible service is the duty not only of the employees handling the physical property of the company but also of those meeting the public in the different departments connected with the accounting, merchandise, meter-reading and installation services. All can do their part in giving service. All employees of these departments can make themselves valuable assets to the company and perform as real service to the public as those employed in dealing with the physical property. Take the complaint clerk; if he (or she) is the right person for this important part of the service, he can greatly improve the company's standing in the eyes of the public.

However, the companies should do their part by seeing that the complaint department is placed in artistic and pleasant surroundings, well equipped with comfortable chairs, such equipment having undoubted psychological effect on the complainants' minds, making them much easier for the clerk to handle. Complaints coming over the telephone should be handled with great care. If practical, the complainant should be invited to call at the office. In any case, the correct name and address should be noted, so that the matter can be investigated with as little delay as possible. It is preferable for the complaint clerk to be a woman, of good appearance and education, with a courteous and tactful manner.

Another form of service that would be appreciated by the public would be a waiting room in the general offices, well appointed and displaying a few electrical appliances, where the ladies could rest and meet one another. Not only would this be of great benefit to tired shoppers but it would also lead to sales of appliances.

The meter-reading department can do a great deal in giving service if the meter readers are careful to observe the rules of ordinary good manners when entering or leaving customers' residences, as they probably have actual contact with a larger number of the company's customers than employees in any other department. The attitude of the company to the public is often judged by the conduct of the meter readers.

Another very important service is now being performed by utility companies, a service profitable to themselves and to the general public and which will in time do more than any other one thing to improve the gradually growing relations between the companies and the public—namely, the sale of preferred stock. As the stock finds its way into the hands of a larger number of the public, there will be wider interest in the affairs of the company and less criticism because of imaginary grievances.

No other industry is so animated with a real zeal for service as is the public utility, and certainly no other industry has a brighter future before it if it is careful to give the community the best service it can at the lowest possible cost. A large number of the public, no doubt, appreciate the constant efforts to reduce the cost of service, but it is well to remind them that electricity is the only commodity that is being sold at a lower cost than in 1914.

Each employee should, therefore, ask himself or herself the question, "How can I better serve the company and the public (as their interests are identical)?"

Industrial Load of New England

Large Field Open for Its Development—Rating of Generators in Private Plants Totals 751,565 Kva.—41.6 per Cent of Energy Consumed for Industrial Plants Is Privately Generated

IN LINE with the policy of keeping the electrical industry informed concerning the latest developments in its field and the present status of its activities, the ELECTRICAL WORLD at the opening of the year initiated a survey of the industrial plants of the country to ascertain the present use of electrical energy for industrial purposes. A similar survey was conducted by the ELECTRICAL WORLD in 1920, and the information gained from that survey has been the basis for much of the industry's studies since that time.

The present survey has been considerably more in detail than was the survey of 1920. The United States Census Bureau has this year co-operated in a most liberal manner by making special tabulations and groupings of the power data gathered by that bureau in 1924. These government tabulations, taken in conjunction with the ELECTRICAL WORLD survey, have furnished a most reliable basis for estimating the present industrial load of the sixteen fundamental industries in each state of the Union. These fundamental industries include all the industries of the country as grouped by the United States Census Bureau.

The present article gives the results of this study on the use of electrical energy by the industries of New England. It is hoped that it will be possible to publish similar articles for the Middle Atlantic and the East North Central States during the coming months and a general review of the industrial load of the United States in the annual statistical issue of January 2, 1926.

There are 17,531 industrial establishments in New England using mechanical power of some kind, the installed power totaling 4,151,136 hp. Based upon returns received in the survey, the estimate is made that 845,805 hp. of this power is in private electric generating plants. Using these figures and the rating of electric motors run by purchased energy as a basis, it is estimated that industry in New England is now 58.2 per cent electrified.

There are 1,038 private industrial electric generating plants in New England, with a total rating of 751,565 kva., of which 628,706 kva. represents alternating-current machines and 122,859 kw. direct-current. The industrial plants of New England consumed 3,093,197,000 kw.-hr. of electrical energy in 1924, of which 58.4 per cent was purchased from central stations and 41.6 per cent was generated in private plants.

There are 323,232 electric motors installed in the industrial plants of the section, with a total rating of 2,667,151 hp., of which 85.3 per cent is the rating of alternating-current motors and 14.7 per cent that of direct-current motors. Approximately two-thirds of the motors are under 5 hp.

In actual number of generating plants the central station is far outdistanced, for in only one state does the number of central generating plants exceed the number of private generating plants, that state being Vermont. Massachusetts leads in private plants with 492, being followed by Connecticut with 200 plants. But the number of generating plants is not the significant figure. The real dominating factor is the amount of energy generated by these plants.

The position of the private generating plant is best shown by considering the various industries of the section. In only two industries is the private plant the predominating factor, and both of these industries are the leading industries in New England. Fifty-four per cent of the energy used by the textile mills of New England is generated in private plants, and the paper industry reports 55 per cent privately generated energy. Here are two industries as fundamentally different as industries can be—one a twenty-four-hour industry, the other normally an eight-hour or ten-hour industry; one

Table I—Distribution of the Industrial Power Load in New England as of

Industry	Number of Establishments Reporting Power	Primary Horsepower					Electric Motors Run by Energy Generated in Private Plants, Hp.	Boilers		Number of Companies Having Private Electric Generating Plants	Estimated Rating of Prime Movers Used in Private Generating Plants, Hp.	Esti-mated Electrification of Industry Per Cent
		Total Primary Horsepower	Owned by Establishments Reporting			Electric Motors Run by Purchased Energy, Hp.		Number	Hp.			
			Steam Engines (Not Turbines)	Steam Turbines	Internal-Combustion Engines	Water Turbines						
All industries	17,531	4,151,136	1,284,656	493,157	46,933	761,211	1,564,728	1,102,423	6,118	1,483,620	1,038	845,805	58.2
Chemicals and allied products	634	112,765	36,910	22,016	3,059	3,433	46,840	29,274	288	72,150	37	16,651	56.4
Food and kindred products	3,561	123,001	40,085	2,977	2,328	6,244	71,367	18,752	152	54,920	68	14,857	70.1
Iron and steel and their products, not including machinery	514	264,499	81,186	26,972	2,947	10,207	143,187	47,409	341	69,390	61	56,121	75.3
Leather and its finished products	1,110	112,819	35,528	7,546	295	1,565	67,885	18,555	110	26,325	48	13,026	71.1
Lumber and allied products	2,096	197,508	116,371	2,161	3,539	20,890	54,547	22,437	909	132,000	95	12,205	33.8
Machinery	1,342	340,396	69,271	43,752	4,553	10,985	211,835	153,977	213	76,567	99	65,959	81.6
Metals and metal products other than iron and steel	972	208,158	37,292	33,640	729	4,950	131,547	70,126	157	48,820	44	55,080	89.7
Miscellaneous industries	713	54,189	13,853	4,037	725	3,059	31,915	6,282	96	9,549	26	8,105	73.9
Musical instruments and phonographs	69	15,233	6,192	427	8	45	8,561	2,411	12	4,723	6	2,025	69.5
Paper and printing	2,209	720,742	156,722	48,764	5,307	370,829	139,120	171,340	821	207,050	104	230,352	51.3
Railroad repair shops	89	26,908	8,930	1,264	87	0	16,627	8,330	44	11,547	8	5,274	81.4
Rubber products	69	146,659	32,660	7,449	8,522	1,510	96,518	23,097	105	55,150	17	23,320	81.7
Stone, clay, and glass products	771	112,609	27,102	1,857	1,939	13,727	68,040	16,631	145	21,723	20	5,908	65.7
Textiles and their products	1,964	1,659,831	610,983	289,120	12,383	312,235	435,110	506,163	2,696	685,470	385	328,370	46.0
Tobacco products	416	435	30	0	207	0	198	3	1	56	1	9	47.6
Transportation equipment, air, land and water	1,002	55,384	11,541	1,175	305	932	41,431	7,636	28	8,180	19	8,543	90.3

an industry of large motors, the other of numerous small motors; one established for the most part in isolated regions, the other within reach of central-station lines—and yet both very large manufacturers of electrical energy on their own account.

The industries of New England taken as a whole are, as nearly as can be figured, 58.2 per cent electrified. The list of industries is headed by the metals and transportation industries, each with a 90 per cent electrification. As is to be expected, the lumber industry is the lowest in electrification, with only 34 per cent of the power electrified. The textile and paper industries, the two leading industries of New England, are 46.0 per cent and 51.3 per cent electrified respectively.

An effort was made to obtain some data on the industrial heating load of New England. The returns indicated that the average monthly industrial heating load totals 37,531 kw. and that 21,712,300 kw.-hr. was consumed during 1924 for industrial heating purposes. These figures, however, are based on very incomplete returns, and the accuracy of the figures given above is questionable. There are at the present time no reliable data on the industrial heating load of the country. The United States Census Bureau, however, on the suggestion of the ELECTRICAL WORLD, is including requests for data on this subject in its next Census of Manufactures, which will be taken at the end of the present year. Some very interesting and valuable data should be available on industrial heating as soon as the results of this census are tabulated.

Turning to the individual industries, it is found that the textile industry—the industry which has made New England one of the greatest industrial sections of the country—is in a class by itself. There are at the present time 1,964 textile mills in New England with a total power installation of 1,660,000 hp. According to the best data available, these plants are now 46 per cent electrified. Last year these mills consumed a total of 827,000,000 kw.-hr. of electrical energy, of which 54 per cent was generated in private plants. The rating of the generators in these private plants totals 297,000 kva., a rating greater than the total central-station rating of any state in New England outside of Massachusetts, and also equal to the combined generator rating of the central-station plants in New Hampshire, Vermont and Rhode Island. These textile mills have a total of 117,000 electric motors installed, but if the industry were completely electrified, this figure would be advanced to more than 250,000 motors. There is a large field for central-station development in New England through the expansion of the textile load. This load is one which is not subject to the same "alibi" as can be put forth for the lumber and paper industries—isolation. The textile mills are within reach of central-station lines at the present time and constitute a challenge to the central-station industry in New England.

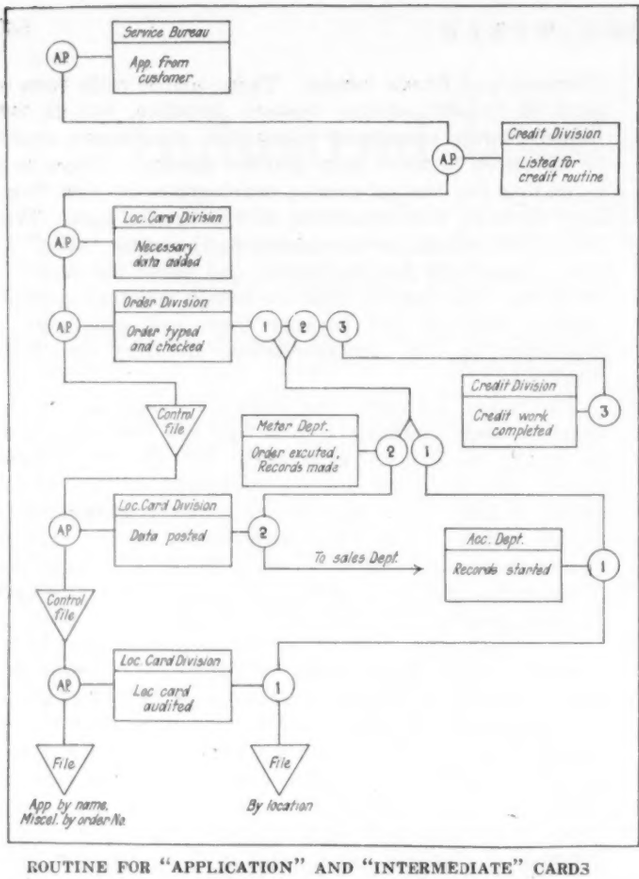
The paper industry, the second industry in importance in New England, is just 51.3 per cent electrified as nearly as can be estimated. Of the 801,380,000 kw.-hr. of electrical energy consumed by the paper plants in 1924, more than 55 per cent was generated in private plants. The high development of the private plants in paper mills is to be more or less expected. These mills are built largely in localities where water powers predominate and are for the most part in isolated locations, both of which conditions contribute toward a large development of the private generating plant. The paper plants use an average of 2,580 kw.-hr. per horsepower of motors installed, a very high use of energy when compared with 880 kw.-hr. per horsepower in textile mills. Of course, one is largely a twenty-four-hour load, while the other, except in emergency cases, is an eight-hour or a ten-hour load. The private generating plants in paper mills of New England have a total generator rating of 192,000 kva., or very close to the total rating of the central-station plants in New Hampshire and Vermont combined.

A total of eighteen different distribution voltages was reported and nine different frequencies. This is to be expected in a section so highly given to the development of the private plant. It indicates that there is a large field for the standardization of electrical equipment in New England.

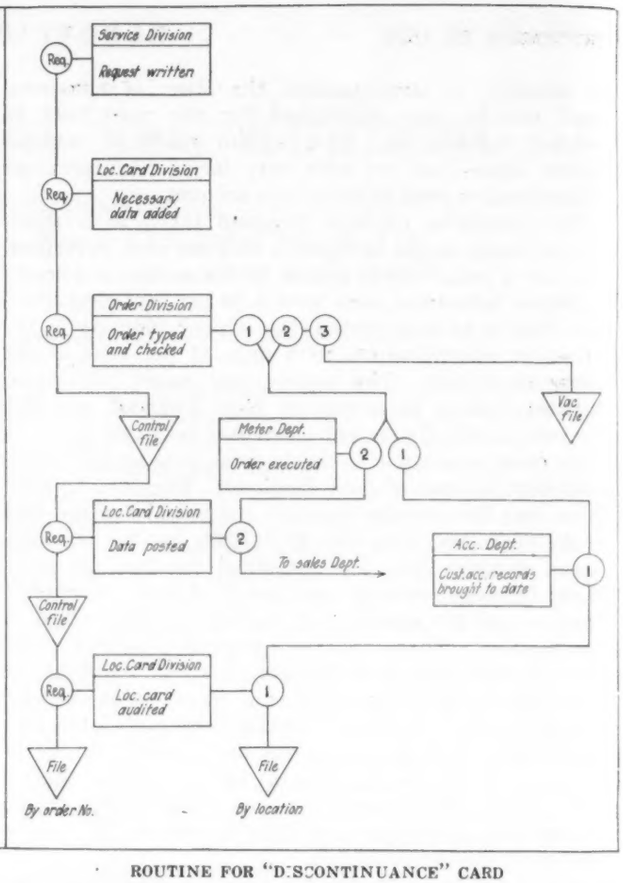
The data to be found in the accompanying tabulation are a summary of the data as collected and tabulated for each of the six New England States. Lack of space makes impossible publication of the detailed state tabulations in these columns, but the state figures are in pamphlet form and will be sent to anyone upon request.

January 1, 1924, and Energy Consumed by Industrial Plants During 1924

Energy Consumed			Generators in Private Plants			A. C. Motors		D. C. Motors		Motors Under 5 Hp.		Industrial Electric Heating	
Total Energy Consumed, Kw.-Hr.	Purchased from Central Stations, Kw.-Hr.	Generated in Private Plants, Kw.-Hr.	Total Rating of Generators, Kva.	Rating of A. C. Generators, Kva.	Rating of D. C. Generators, Kw.	Number	Hp.	Number	Hp.	Number	Hp.	Average Monthly Load During 1924, Kw.	Energy Consumed During 1924, Kw.-Hr.
3,093,197,000	1,807,222,000	1,285,975,000	751,565	628,706	122,859	266,340	2,273,626	56,892	393,525	206,480	403,802	37,531	21,712,300
98,676,000	60,730,000	37,946,000	15,371	11,894	3,477	6,191	66,660	4,185	9,454	5,498	16,816	250	488,500
122,110,000	96,728,000	25,382,000	13,292	10,401	2,891	4,185	67,590	4,406	22,529	5,071	15,804	232	515,200
242,861,000	182,447,000	60,414,000	51,487	43,210	8,277	9,275	162,389	3,368	28,207	5,311	9,609	7,603	4,493,900
96,884,000	76,686,000	20,198,000	11,931	11,368	563	5,324	85,135	226	1,305	2,078	6,207	74	205,500
36,149,000	25,602,000	10,547,000	10,736	9,576	1,160	7,399	72,468	583	4,516	4,364	15,158	66	217,000
237,820,000	137,716,000	100,104,000	60,807	42,981	17,826	55,859	271,112	14,717	94,700	55,427	143,500	7,430	4,396,600
181,223,000	120,783,000	60,440,000	50,859	29,693	21,166	37,483	132,924	11,294	68,749	26,707	65,701	12,216	2,554,500
64,817,000	54,306,000	10,511,000	7,735	1,320	6,415	3,054	38,197	0	0	1,467	2,939	230	452,800
7,875,000	6,241,000	1,634,000	1,835	1,449	386	467	7,035	420	3,937	660	1,984	0	0
801,380,000	359,290,000	442,090,000	192,341	175,896	16,445	10,428	264,177	8,358	46,283	10,448	21,213	740	1,489,800
24,529,000	16,310,000	8,219,000	4,745	3,146	1,599	588	10,585	1,038	14,372	447	1,431	22	66,500
191,914,000	154,814,000	37,100,000	21,491	18,620	2,871	8,054	103,485	518	16,130	3,442	8,317	1,158	1,525,500
70,445,000	56,620,000	13,825,000	4,333	2,627	1,706	3,731	83,954	144	717	1,863	7,026	0	0
826,880,000	382,310,000	444,570,000	296,730	259,480	37,250	110,994	874,269	6,301	67,004	82,307	83,125	1,505	4,050,000
440,000	433,000	7,000	8	8	0	106	129	15	72	115	128	0	0
89,194,000	76,206,000	12,988,000	7,864	7,037	827	3,202	33,517	1,319	15,550	1,275	4,844	6,005	1,256,500



ROUTINE FOR "APPLICATION" AND "INTERMEDIATE" CARDS



ROUTINE FOR "DISCONTINUANCE" CARD

1

METER WORK FLAT RATE ORDER NO. (14)

DATE WRITTEN | DATE TO EXECUTE (1)

SCHEDULE (2) | AREA (3) | CREDIT (4) | LEDGER | CARD | BILL AD. PL. | LEDGER CARD

ADDRESS (5)

NAME (6) PHONE

FLOOR AND DIRECTION (7) REF (8)

PREDECESSOR OCCUPIED

KEY AT AS

SEND BILL TO

MOVING FROM

LAMPS (9) DELIVERY TICKET (10)

CLASS OF ORDER

METER SET	METER FR VAC.	METER DIRECT	FL. RATE INST.	METER OR COIL CHANGE
METER REMOV.	METER TO VAC.	FL. RATE DIR.	FL. RATE C. O.	
INSTALLATION METERING REQUIREMENTS	AMPS	VOLTS	WIRE	PHASE

SPECIAL INSTRUCTIONS: BILL CUSTOMER FROM (11)

DATE COMPLETED (12)

H. E. LT. CO. NO. OF METER (13)	K	STARTING READING	SPECIAL READING	FINAL READING

CHECK METER NUMBERS AND CONSTANTS FROM OPPOSITE SIDE

SPECIAL REPORT

REPORT ON LOAD

LIGHTING K. W.

POWER & HEATING K. W.

CHARGE ISSUED BY TOTAL FOR BURNING HR. DISCOUNT

(SIGNED)

CHECKED L'T'G DEPT. | METER READ PLATE | LOCATION CARD | NAME CARD | ORDER FILE

H. E. LT. CO. FORM NO. 7148 USE REVERSE SIDE FOR FURTHER REMARKS.

ORDER FORM, 8 IN. X 5 IN., IN TRIPLICATE

INTERIOR WIRING

INSPECTION

OFFICE COPY

ADV.

NO. 6901

ADDRESS OF BUILDING
CONTRACTOR'S
CLIENT

TYPE OF BUILDING

OWNER—BUILDER—TENANT

CONTRACTOR'S NAME AND ADDRESS

SERVICE LOCATION

	SIDE	FRONT	BACK OF	FRONT OF
N W E S				

REMOVE CARBON BEFORE WRITING AT RIGHT

NOTES

PRESENT TRANSFORMER

SECONDARY EXTENSION

READY FOR O. H. U. G. SERVICE

TRANSF'M'R LOCATION

FORM OF SERVICE	SIZE OF CONDUIT	SIZE OF CONDUIT SERVICE WIRE	SERVICE INSTALLED

L. H. OR P.	ST. NO.	FLOOR OR SUITE	LOOPS KIND	LOOPS SIZE	LOAD TO BE INSTALLED CIRCUITS	KW.	H. P.	DATE APPR.	REMARKS OR AREA
			TOTAL						

ADDITIONAL ENTRANCES

SERVICE SPECIFICATIONS

DATE	WIRE	PHASE	VOLTS

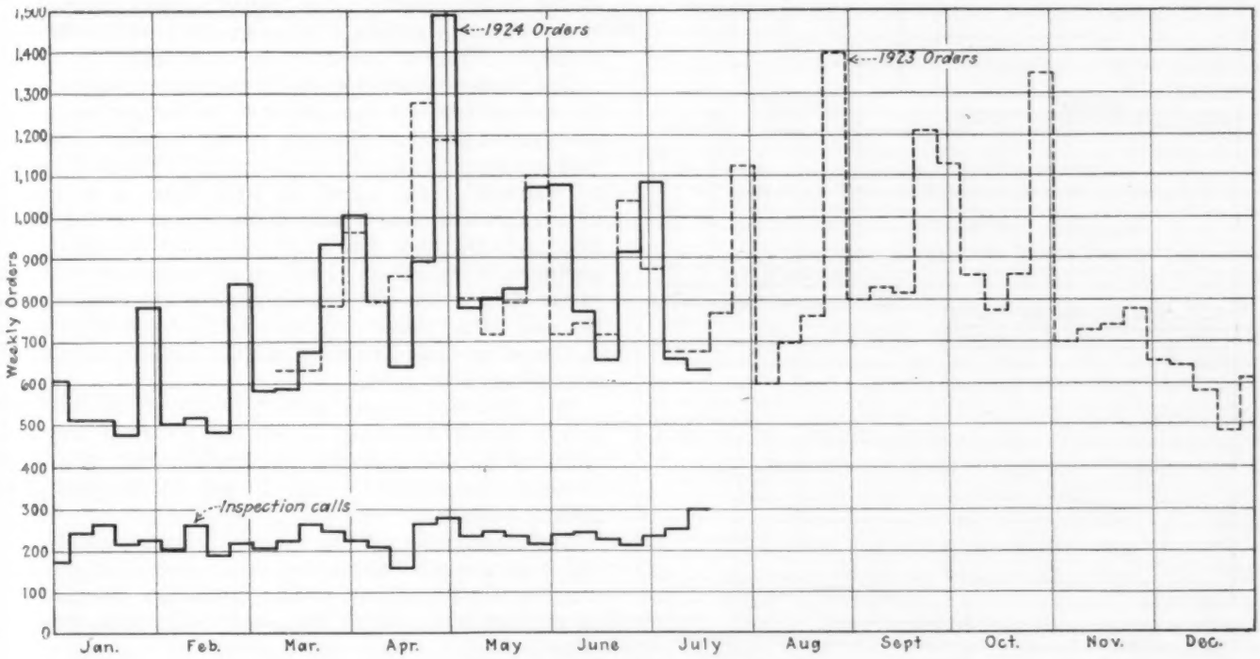
INTERIOR WIRING ORDER, 8 IN. X 5 IN., IN TRIPLICATE

Improved Customers' Record System

Routing and Control System Facilitate Rapid Service Installation—High Moving Ratio of Customers During Peak Seasons Now Gives Little Trouble to Hartford Central-Station Company

By MALCOLM BARTON
Assistant to the General Manager Hartford Electric Light Company
Hartford, Conn.

THE Hartford (Conn.) Electric Light Company has always endeavored to give rapid service to its customers, especially during moving periods, which occur the first of each month, with peaks for April, May, September and October. Because of these moving periods 40 per cent of the orders are written during one week of the month. Normal service provides for connection the same day if application is made before 9:30 a.m. It was becoming impossible with a system fifteen to twenty years old to handle satisfactorily a moving ratio of 33 per cent and an annual increase of 10 per cent in customers.



WEEKLY CHART OF CUSTOMERS' ORDERS

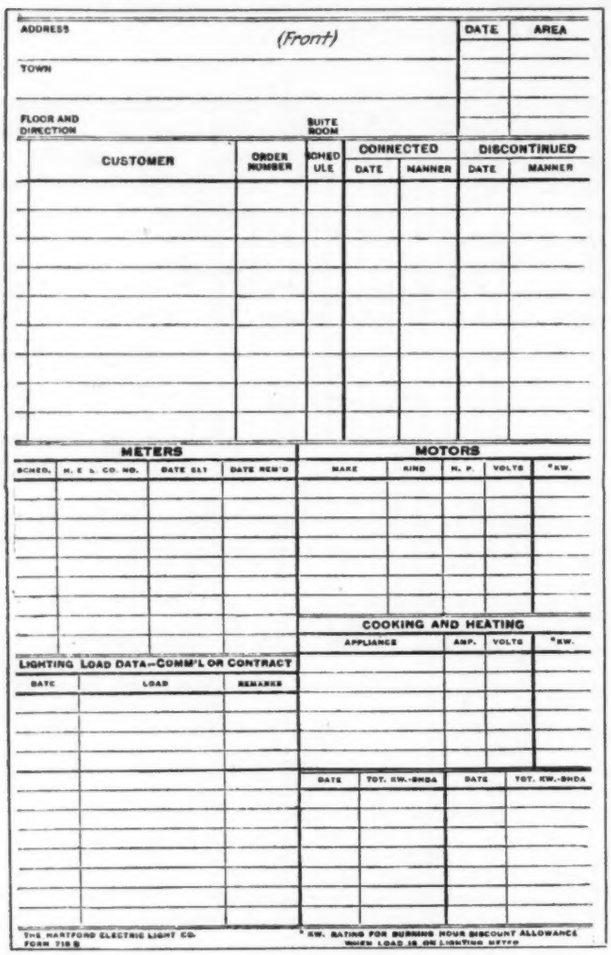
Realizing the need for simplified routine with its specialized functions, and that this routine should establish correct relations with the meter and accounting departments, it was considered best to take counsel with the Bureau of Commercial Economics of Chicago in the revision. After approximately one month's survey satisfactory forms and routine charts were agreed upon, and the equipment was purchased for putting the new system in operation on January 2, 1923.

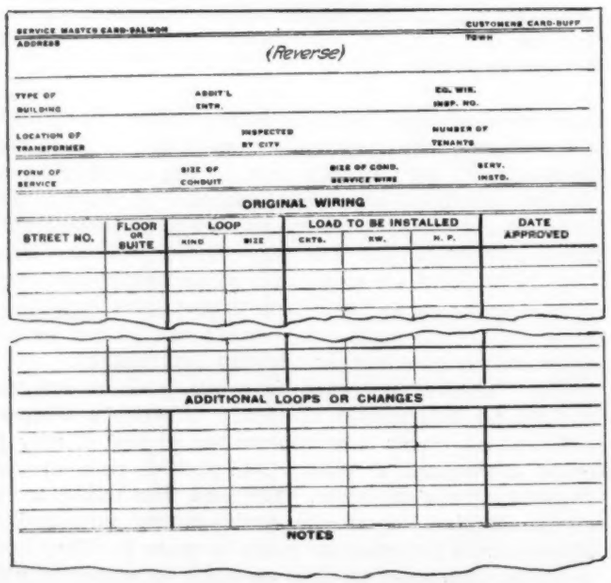
The change-over was made by using the addressograph plates of the meter department for stamping the new "location" cards. Information on these plates was sufficient to carry on the business, but other necessary information had to be transferred later to make the records complete. The new forms are shown herewith. The "location" card carries information that was formerly carried in three separated files, and its adoption reduced the number of cards from 120,000 to approximately 50,000. This card carries information regarding the permanent characteristics of the building or apartment, and it remains in the file as long as the building is in existence. One salmon-colored card is used for each service, with a buff-colored card for each apartment in cases where there is more than one apartment or store from the same service. The permanent information consists of service characteristics, area measurement for use as a part of the company's residential schedules and other special loop notes. The meter is carried by company number and schedule only. Space is provided for a change of nine tenants. Postings to the card are made as brief as possible by using code letters, such as "MFV" for "Meter transferred from vacancy." Only such other notes are posted as are necessary to give complete billing information.

The "application" card is white and is designed to hold all information necessary to write a complete order and to carry this information so that it may be easily copied and checked. All possible data are obtained from the customer. The card then passes to the credit division, where the credit rating is placed in space 4 from information given in space 5. Very little delay is occasioned by this as quick reference may be

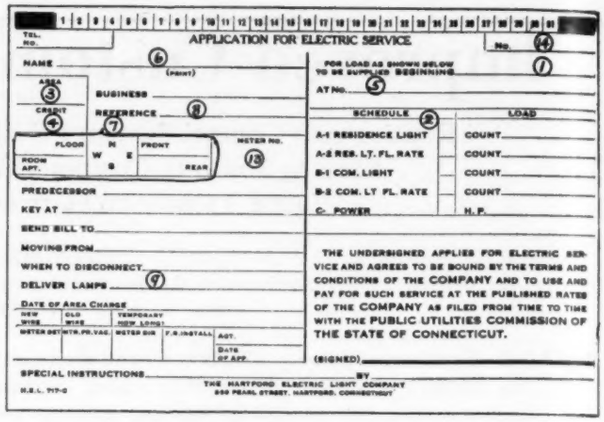
made direct to the customer's account; or, in case the name is not on the records, it is listed only and the card is forwarded to the records bureau.

The card then passes over the "name" file for checking and to the "location" file, where various items, such as area, class of order, etc., are added. The order is then typed, checked and distributed, the card returning to its proper "location" card desk to be used as a "follow-up" on the execution of the order. After copy 1





"LOCATION" CARD, 8 IN. x 5 IN.



"APPLICATION" CARD, 4 IN. x 6 IN., WHITE

returns the card is filed permanently by name (see routine charts).

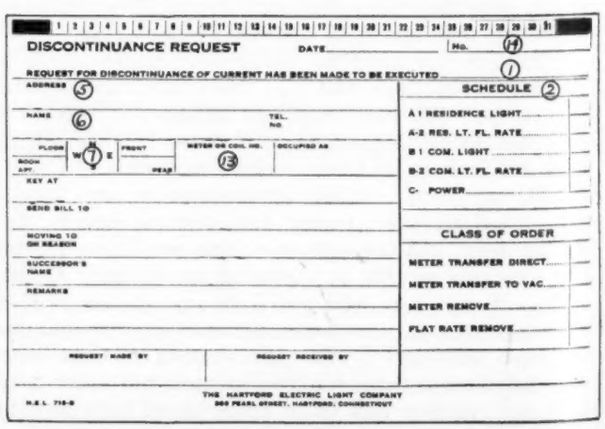
The "discontinuance" (buff color) and "order request" (salmon color) are handled in routine as shown on the routine charts. The "order request" is used for all intermediate orders such as special readings, change of meter, change of schedule, or corrections.

The "order" form is made in triplicate, the routes of the various copies being indicated on the routine charts. The circled positions indicate where items are typed as they are copied from the "application," "discontinuance" or "request" cards. Position 10 is filled in on copy 2 by a lamp clerk when a lamp delivery is called for. Position 11 is the only date with which the accounting department is concerned. Position 12 is the date executed in the field or the date meter records are completed in the case of a "paper" transfer. The class of order is indicated by code letters or an "X" before the class in which the order falls.

The "interior wiring order" (IWO) is in triplicate and so arranged that copy 3 becomes a carbon copy of 2, carrying all data gathered in the field with which the wireman is concerned. Copy 3 folds for mailing in an outlook envelope.

The organization of the records bureau logically falls into four groups—inspection, order control, order writing and trouble service. The inspection group covers all contact with the wireman and makes area measurements.

The "interior wiring order" (IWO) is typed immediately upon receipt of either a notice from a wireman or information from any other source, indicating that

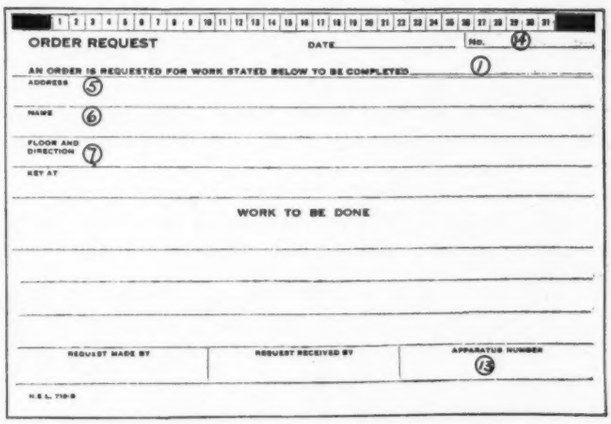


"DISCONTINUANCE" CARD. 4 IN. x 6 IN., BUFF

a wiring job is contemplated. The "IWO" is then placed in a date file for inspection. The inspector takes copy 2 and copy 3 into the field and sketches the building, showing meter and service location, and also records other data useful to the distribution department. Upon his return to the office copy 3 (a carbon copy of 2) is immediately mailed to the wireman and copy 2 placed in the date file under an advance date considered proper for close "follow-up." The clerk then has all the data available for immediate reference to answer inquiries. The clearance by municipal authorities is received by this clerk twice daily, and installation orders are issued at once upon receipt of these releases.

The control file of this group carries the office copies of all wiring jobs under way, in one section by location and in a second section the field copies of those jobs by date. In the case of a new wiring job no installation order is issued until the inspector has passed it for service, the "live wire" inspection being done by the meter man.

The order control group is made up of the "name" file and "location" file. Each "location" desk has its


ORDER REQUEST DATE No. (14)

AN ORDER IS REQUESTED FOR WORK STATED BELOW TO BE COMPLETED (1)

ADDRESS (5)

NAME (6)

FLOOR AND DIRECTION (7)

KEY AT

WORK TO BE DONE

REQUEST MADE BY | REQUEST RECEIVED BY | APPARATUS NUMBER (13)

"INTERMEDIATE" CARD, 4 IN. X 6 IN., SALMON

order control section, in which are filed all applications, discontinuance and order requests immediately after the order has been typed. These are signaled for reference at the normal advance date. Orders that are delayed for any reason are immediately indicated by the signals. The clerks make pencil memos on the "location" cards as the order requests pass over their desks the first time. The posting is made in ink when the No. 2 copy returns from the meter department.

The order writing group receives the order requests complete, and it becomes a simple typing operation to transfer to the order form. One "Fanfold" typewriter is now in use, with a second machine available for filling in over the peaks. After typing, the order is checked and distributed. Copies 1 and 2 go to the meter department for execution, copy 1 being the field copy.

The trouble service group receives all trouble calls. When not busy receiving calls the clerks are able to aid in sorting papers and in calculating areas for inspectors.

After eighteen months' experience the system above outlined is considered a great improvement over the previous method. All departments concerned have been benefited by the close routine and definite instructions with standardized terms. Further changes may be developed as the demands of the service make it necessary or economical.

Letters from Our Readers

Minnesota Tax a Handicap for Electric Trucks

To the Editor of the ELECTRICAL WORLD:

A tax measure passed by the last Minnesota Legislature and which may be copied in other states deserves the attention of all branches of the industry interested in the advancement of the electric truck. This state tax calls for a levy of 2.4 per cent of the base value on trucks hauling farm products, 5 per cent on trucks hauling merchandise or materials owned by the owner of the truck and 10 per cent on trucks for hire or doing general hauling.

As this tax is based on the list price of the truck, including battery and body, the effect has been to retard the development of electric trucks in Minnesota. A state organization of truck owners has been formed, and an attempt will immediately be made to enjoin the Secretary of State from enforcing the law, which is asserted to be discriminatory and unconstitutional. Minnesota automobiles are taxed as personal property and not as a special privilege, and the best legal talent believes that the new tax will be quickly annulled.

H. S. GREINER,
Chairman Minneapolis Electric Truck Club.
Northern States Power Company,
Minneapolis, Minn.

Electrical Power Developments in Great Britain

To the Editor of the ELECTRICAL WORLD:

American readers may be interested in the fact that present-day movements in power developments show that electricity is coming into its own in the British Isles. At the recent opening of a power station at Ringwood, Hampshire, the Minister of Transport stated that Great Britain was on the eve of the age of electricity. Although it will be considerable time before the full advantages of reorganization mature, rapid progress is new being made toward that end. Cheap power is the foreword, not only for commercial use, but for heating, cooking and domestic service generally. Big electrical undertakings, including the Severn dam, coal conservation, the standardization of supply at a cost of £10,000,000 and the introduction of windmill generation, are receiving every consideration from the present government.

The late war forcibly brought home to Great Britain the vital necessity of a cheap and abundant supply of electricity, and within the last few years great strides have been made in this direction. Tramways and trolley vehicles now use nothing but electricity, and all suburban railways are gradually becoming electrified. Industries such as the electrochemical and electrometallurgical depend entirely on electricity for their existence, while others, such as weaving, are dispensing with steam and introducing electricity.

England, with its innumerable river mouths, is admirably equipped for the production of electricity. It is often supposed that coal is the most important factor, and it is, of course, of paramount importance, but water for cooling purposes is even more important. Large stations have recently been built in the Clyde Valley and at Manchester, and these stations have not been placed in the midst of neighboring coal fields, but where an ample supply of water is available.

Brokenham, Kent, England. AN ENGLISH READER.

Central Station and Industrial Practice

Coal-Handling Equipment of Indiana Station

A FEATURE of the reconstruction work at the Goshen power station of the Interstate Public Service Company at Goshen, Ind., was the installation of the entirely new coal-handling equipment without interfering with the operation of old boilers. In order that the plant might be operated to capacity, even while the conveyor installation was being completed, the engineers of the Stearns Conveyor Company, who did the work, provided that the new work be carried on from both ends of the power plant toward the middle. The old equipment was thus removed and the new work joined without loss of time. This method made possible the immediate use of the new conveying system at the time it was being installed.

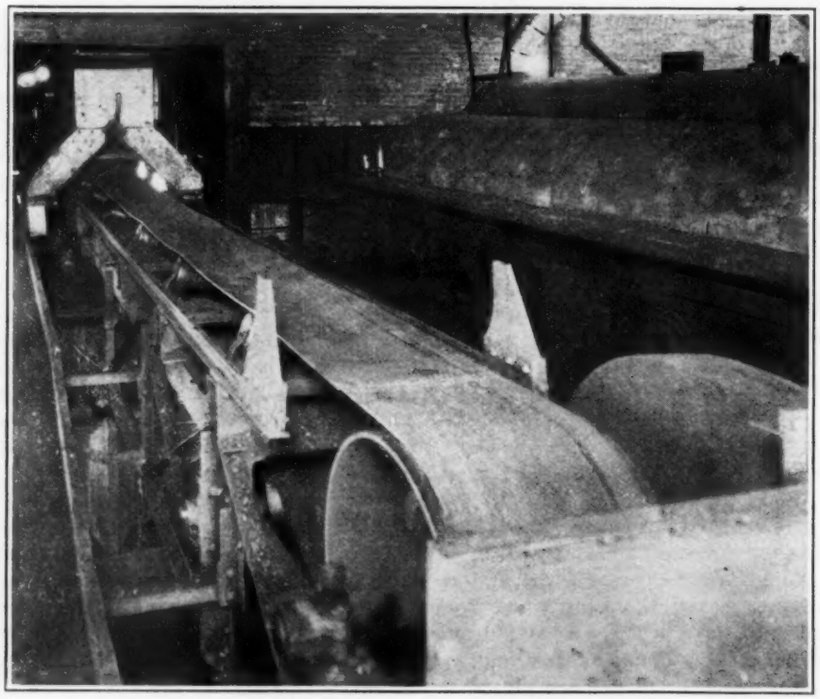
GOSHEN STATION OF INTERSTATE PUBLIC SERVICE COMPANY

The importance of continuity of operation of the Goshen plant may better be realized when it is understood that the station is one of a series used by the Interstate Public Service Company in supplying the requirements of a growing industrial section and the needs of the several companies supplying power and traction service and light, which during recent years have been consolidated as part of the Interstate interests.

Under the new arrangement the coal is fed from a steel hopper by a reciprocating feeder onto an 18-in. belt conveyor, which runs up and into the boiler room and then horizontally over the coal bunkers. A self-propelled reversing tripper travels back and forth on the horizontal run and distributes the coal evenly into the bunkers in front of the boilers.

The belt conveyor is driven through a spur gear speed reducer and the feeder from the tail shaft of the conveyor by means of chain drives. The conveyor structure is made of steel, the portion outside of the boiler room being in the form of a housing over the conveyor and covered with galvanized corrugated steel. The side adjacent to the walkway is composed of removable panels, making the conveyor readily accessible for inspection and greasing.

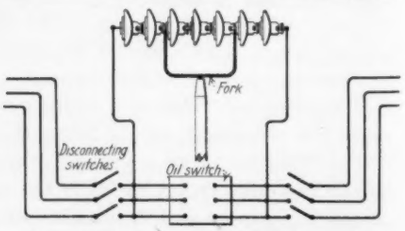
It is thought that all future needs have been provided for in this plant. At present only coal screenings are delivered to the plant, but provision has been made so that a crusher can be installed between the hopper feeder and the belt conveyor, in the event that it is found necessary or desirable to purchase lump coal.



BELT CONVEYOR INSTALLED AT GOSHEN STATION OF INTERSTATE PUBLIC SERVICE COMPANY

Insulator String Used for Phasing Out Circuits

IN PHASING out 66-kv. and other high-tension lines the California Oregon Power Company uses a string of suspension insulators in the manner shown in the accompanying diagram. The use of an insulater string for phasing is not new, but the manner in which it is applied by this company allows all phasing to be done by simply opening



ONE SET OF CONNECTIONS PERMITS PHASING WITH INSULATOR STRING

and closing disconnecting switches after the connections have been made as shown.

This is accomplished, as shown in the diagram, by connecting all three phases on each side of the oil switch to a common wire leading to one end of the insulator string. Any one of the three disconnecting switches on each side of the oil switch is then closed until the corresponding phases are located.

Inexpensive Outdoor Substation

An Automatic Substation with Distribution Feeder Voltage Regulation Designed to Serve Residence Districts Built at Low Cost

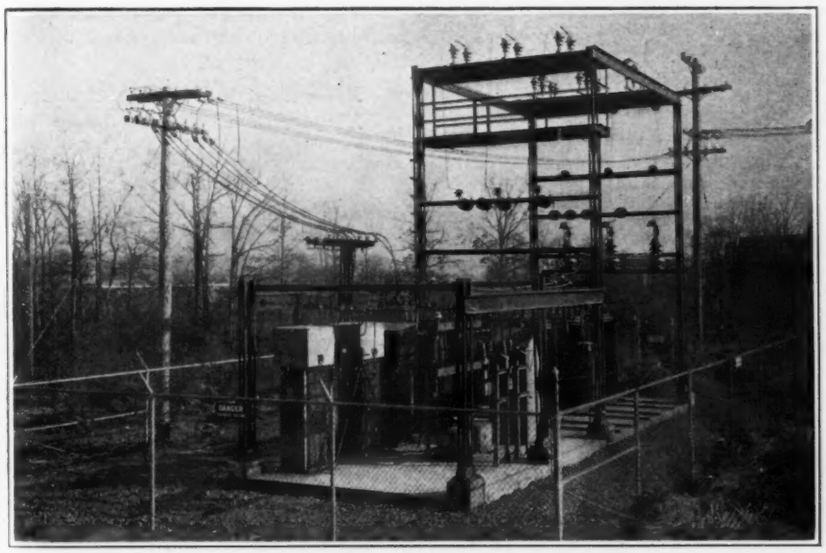
By G. A. Iler
Electrical Engineer Pennsylvania-Ohio Power & Light Company
Youngstown, Ohio

A NEW step-down substation has recently been completed by the Pennsylvania-Ohio Power & Light Company in the North Side residence district of Youngstown, Ohio, which combines outdoor construction with distribution voltage regulation and automatic restoration of service. These features are obtained at an over-all cost of $9.60 per kva. for the total 3,000-kva. capacity of the station and a cost of about $16 per kva. for the 1,500-kva. initial installation just completed.

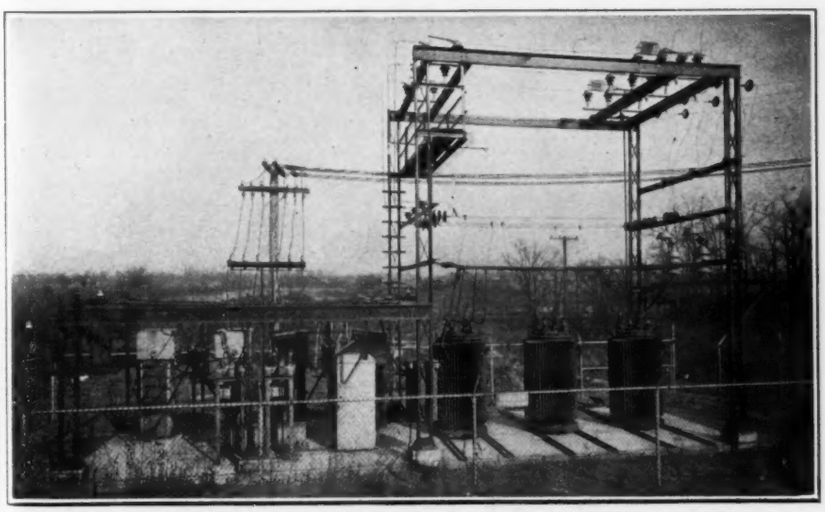
Energy is supplied to the substation from the Lowellville power plant over a 22,000-volt transmission line and is stepped down to 2,300 volts through a bank of three outdoor type 500-kva. transformers.

Johnson live line clamps are used throughout the substation in place of disconnect switches in order to facilitate cutting the transformers in or out. The bus-work is 22,000 volt, three-phase isolated delta, with a fourth wire in position with no connections for use as an insulated dead bus to support one of the Johnson clamps from one of the transformers while the second clamp is being taken off in order to cut one transformer out of service and leave the others in an open delta connection. This arrangement makes it possible for one man with one disconnect stick to do the work.

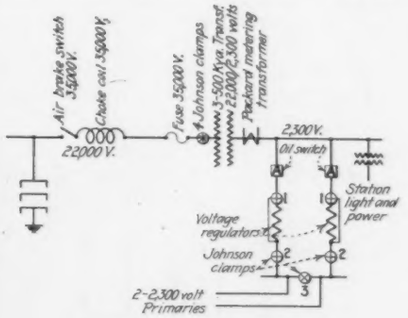
There are two No. 4/0, 2,300-volt primary distribution lines leaving the substation. Each line has a potential voltage regulator and an automatic reclosing oil circuit-breaker. The feeder voltage regulators automatically increase or decrease the feeder voltage above or below the station voltage within a limit of approximately 10 per cent, according to the size of the load on each circuit. The circuit breakers after an interruption automatically close twice at one-minute intervals. If the interuption causes the breaker to trip the third time, it locks open until normal conditions are restored by operators. In this way a circuit on which trouble occurs is automatically cut off without disturbing the other circuit.



OUTDOOR SUBSTATION, SHOWING USE OF LINE CLAMPS INSTEAD OF DISCONNECT SWITCHES



THE ARRANGEMENT OF THE 2,300-VOLT SIDE OF THE SUBSTATION



ONE-LINE DIAGRAM OF SUBSTATION

Obtaining Odd Frequencies for Vibrating Screens

TWO 25-cycle generators, belted to line shafting and run at off speeds, solved the problem of supplying odd frequencies to electric vibrating screens in the plant of the Ottawa Silica Company, Ottawa, Ill. At one stage in the prepara-

tion of the silica sand produced in this plant, vibrating screens are used to separate sand grains of small size variation.

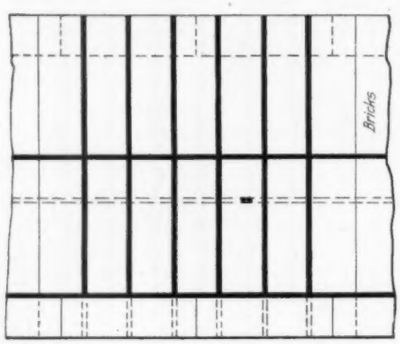
When in operation the best results from the screens are obtained when they are vibrated at one particular frequency. The service supplied to this plant by the Illinois Power & Light Corporation has a frequency of 60 cycles, but the two batteries of vibrating screens were found to operate most satisfactorily at a speed corresponding to 29 cycles and 15 cycles.

To provide these frequencies, two 25-cycle generators were belted to convenient line shafting and operated, one at a speed above normal and one at lower than normal speed, with complete success.

Rugged Furnace-Wall Construction

BY W. G. SHURGAR
Superintendent of Power Stations, Arkansas Central Power Company, Little Rock, Ark.

THE usual arrangement of bricks in furnace walls is not employed in the Little Rock plant of the Arkansas Central Power Company. Instead, alternating layers of brick are laid up as shown in the accompanying illustration to make a 21-in. wall.



METHOD OF LAYING UP ALTERNATE LAYERS OF BRICK FOR FURNACE WALLS

Some of the advantages claimed for this arrangement are that it can burn back a long way without falling apart because of ties and lack of vertical seams. However, it is difficult to remove burned-out sections and fit in new sections.

This arrangement of bricks is used on three 600-hp. and three 682-hp. boilers, the brick maintenance on which, exclusive of total replacements, has been about $2 per rated horsepower per year. According to experience, the settings will last about ten years.

Calculation of Voltage Regulator Settings

BY VERNE V. GUNSOLLEY
Research Engineering Department, Kansas City (Mo.) Power & Light Company

THE DEGREE to which regulation calculations have been simplified is not evident from the literature extant upon the subject. All methods, so far as known, involve the calculation of the per cent drop in the lines. The following method for induction voltage regulators derived by James H. Carmean reduces the calculation to its simplest form without the sacrifice of exactness and has worked out so successfully in practice that it is not customary to check up the voltage reading at the feeding center, only the calculations being verified.

Let the ratio of the power in the regulator circuit to the apparent power in the compensator circuit be termed the Transformation Ratio. Then the transformation ratio = Current transformer ratio ÷ Potential transformer ratio.

Thus if current transformer ratio = 30:1 and potential transformer ratio = 20:1, then transformation ratio = (30 ÷ 1) ÷ (20 ÷ 1) = 30 ÷ 20 = 1.5.

The next step is to calculate the resistance and inductive reactance in ohms on one wire with zero return (as in balanced three-phase calculations) from the regulator to the feeding center. Let the distance be 2,400 ft., then

$R = 2.4 \times 0.04966 = 0.1190$ ohm (with No. 4/0 copper).
$X = 2.4 \times 0.01065 = 0.0256$ ohm (with No. 4/0 copper at 60 cycles).

Multiply these values by the transformation ratio and get

$R = 1.5 \times 0.1190 = 0.1784$ ohm.
$X = 1.5 \times 0.0256 = 0.0384$ ohm.

These values are correct for balanced three-phase circuits and may be used for the three-phase regulator, or for each one of three regulators on a three-phase circuit regulating to neutral. For a two-phase, three-wire circuit these later values must be multiplied by the constant 1.5:

$R = 1.5 \times 0.1784 = 0.268$ ohm.
$X = 1.5 \times 0.0384 = 0.0576$ ohm.

For single-phase, two-wire, the constant to be used is 2 and the values would then be:

$R = 2 \times 0.1784 = 0.3568$ ohm.
$X = 2 \times 0.0384 = 0.0768$ ohm.

These values having been obtained, the only remaining operation is to divide them by the resistance per step on the compensator. There are four ohms and twenty steps, so the resistance per step is 0.2 ohm. Hence for the three-phase circuit:

0.1784/0.2 = 0.892 or step 1 *(R)*.
0.0384/0.2 = 0.019 or step 0 *(X)*.

Date 5-11-23 — ANALYSIS OF VOLTAGE REGULATION — Circuit—P-433

Section of Feeder	Distance, Ft.	Ohms One Wire R	Ohms One Wire X	Times One Wire	Ohms Effective R	Ohms Effective X	Transformation Ratio	Compensator Equivalent Ohms R	Compensator Equivalent Ohms X	Compensator Settings 0.2 Ohm per tep Flat R	Flat X	Plus R	Plus X
ABCN	2,000*	0.120	0.080	1	0.120	0.080							
ABCN	2,600†	0.260	0.286	1	0.260	0.286							
BCN	1,800	0.180	0.198	1.5	0.270	0.297							
CN	4,500	0.450	0.495	2	0.900	0.990							
At				Phase									
Eighth and Cherry				*A*	0.380	0.266	2 to 1	0.760	0.732	4	4	9	9
Thirteenth and Cherry				*B*	0.650	0.663	2 to 1	1.3	1.33	6	7	11	12
Nineteenth and Charlotte				*C*	1.550	1.653	2 to 1	3.1	3.31	15	16	20	21
				N	.....	.....	.....	.....	.....	4	4	4	4

*Underground
†Overhead

In the left column is the scheme of distribution. All four wires (same size copper), A, B, C and N, feed 2,000 ft. under ground and then go overhead for an additional distance of 2,600 ft. Just below is given the information that phase A ends at Eighth and Cherry, from which it is seen that the feeding center at Eighth and Cherry is 4,600 ft. distant and is fed by all phases. From Eighth and Cherry phase wires B, C and N go on to Thirteenth and Cherry, an additional distance of 1,800 ft. From there the circuit is single phase to Nineteenth and Charlotte, 4,500 ft. further. In the third and fourth column are given the single-wire ohms corresponding to the lengths of the circuits involved. Column five lists the circuit constants. Columns six and seven are the products, respectively, of columns three and four multiplied by the constants in column five. Considering now the last four lines of the table, phase A to Eighth and Cherry has $R = 0.120$ for the 2,000 ft. length overhead and $R = 0.260$ for the 2,600 ft. length underground, a total of $R = 0.380$. Likewise $X = 0.080 + 0.286 = 0.266$.

Phase B has the same values as phase A up to Eighth and Cherry and the added values of $R = 0.270 \times 0.297$ for the 1,800 ft. extension to Thirteenth and Cherry, or a total of $R = 0.380 + 0.270 = 0.650$, $X = 0.286 + 0.297 = 0.663$.

Phase C likewise has the same values as phase B up to Thirteenth and Cherry plus the added values of $R = 0.900$, $X = 0.990$ for the 4,500-ft. extension to Nineteenth and Charlotte. The transformation ratio given in column eight (= current trans. ratio ÷ potential trans. ratio) = 2:1; therefore, multiply the R and X values by two, resulting in values given in columns nine and ten. Dividing the latter values by 0.2, the number of compensator steps is found and listed in columns eleven and twelve.

Since each step on these particular compensators gives 1 per cent line drop compensation, 5 per cent over-compensation is obtained at the feeding points by merely adding five steps to the values in columns eleven and twelve and listing them as shown in column thirteen and column fourteen.

If being used on a two-phase, three-wire circuit, the setting is:

0.268/0.2 = 1.34 or step 1 *(R)*.

0.058/0.2 = 0.29 or step 0 *(X)*.

If used on a two-wire circuit, the settings are:

0.3568/0.2 = 1.78 or step 2 *(R)*.

0.0768/0.2 = 0.038 or step 0 *(X)*.

To overcompensate by any percentage, it is necessary only to increase the number of steps in the setting by the desired percentage of overcompensation. The neutral should never be overcompensated.

In the accompanying table is the form used and devised by Mr. Carmean for keeping a record of and for systematizing calculations.

Electric Tractor Saves $3,442.70 per Year in Tannery

By C. B. Adams

Superintendent Joseph Eisendrath Company, Chicago, Ill.

IN A TANNERY it is imperative that the fleshings removed from the hides be not allowed to accumulate, otherwise they very quickly give rise to an offensive odor. Prior to two years ago the Joseph Eisendrath Company of Chicago had no means for the prompt removal of the fleshings and as a result had to contend with a high labor turnover and an inability to get women to work in the glove factory located next to the tannery.

The former method of handling fleshings was to pile them up and at regular intervals carry them away in baskets. About two years ago a Mercury tractor, together with twenty trailers, was purchased and put to work handling these fleshings, which are thrown into boxes on the trailers and when the boxes are filled are pulled out by the tractor.

It was found that the removal of fleshings did not require very much of the tractor's time and it was therefore gradually given more work to do until at present it is being used more than thirty-five hours per week. The electric tractor hauls the hides from one department to another, brings in from freight cars all materials purchased for use in the tannery, and, when necessary, is used for spotting freight cars.

The tractor runs on wood, brick and cement pavements. At times it must go where the floor is wet and slippery and traction difficult. The operator carries a bucket of salt on the tractor and throws a handful under the wheels when necessary to get traction on slippery floors.

The tractor hauls an average of 100 tons every day. The longest haul is 900 ft., and the average haul is 300 ft. Most of the handling is on level floors, but there is one ruling grade of 10 per cent which the tractor has no difficulty in negotiating with a trailer loaded to 3,000 lb.

The cost of the tractor was $1,525 and of the battery $620. Based on the service thus far given, the tractor should last ten years. The battery has a life of three years with a 10 per cent trade-in value at the end of that time.

No regular operator is assigned to the tractor. Any one of a gang of workmen operates it when necessary. The tractor is charged by a rectifier installed some time ago for use in charging an electric automobile, so there is no extra investment in charging equipment.

The total operating cost per day, including fixed charges, electric current, maintenance, repairs and labor for the operator, amounts to $5.91, or $0.059 per ton of material handled.

The prompt removal of the fleshings resulted in the elimination of the odor which made the working conditions in the tannery and glove factory so unpleasant. The reduction in labor turnover in the glove factory as a result of the use of the tractor is worth $2,500 per year, because of the lessened expense of training new employees and because production is not lowered through using inexperienced employees.

Additional savings are effected, because it would require two more laborers at $1,300 per year for trucking if the tractor were not used. The gross annual saving is therefore $5,100. Subtracting the annual operating expense of the tractor leaves a net saving of $3,442.70 per year by using the electric tractor.

The electric tractor has been found a very useful part of the material-handling equipment of the tannery. It has gradually taken on extra duties until it is now practically indispensable. Recently the tractor was given its first overhauling after one and one-half years' use. The performance of the tractor in this factory has proved a very profitable investment.

A HEAVY LOAD OF GREEN HIDES IS QUICKLY MOVED BY AN ELECTRIC TRACTOR

OPERATING EXPENSE AND SAVINGS WITH ELECTRIC TRACTOR

Cost of Operation	
Depreciation, tractor, $1,525 for ten years	$152.50
Depreciation, battery— ($680) — $68) for three years	204.00
*Average interest at 6 per cent on tractor	50.32
*Average interest at 6 per cent on battery	24.48
Power, 4,550 kw.-hr. at $0.02 per kw.-hr.	91.00
Repairs and maintenance, chassis and battery	125.00
Tires (set costing $75 lasts nine months)	100.00
Operator, 52 weeks, 35 hours at $0.50 per hour	910.00
Total annual operating cost	$1,657.30
Cost per day, $1,657.30 for 280 days	5.91
Cost per ton	0.059
Savings Effected	
Value of decreased labor turnover in glove factory	$2,500.00
Saving in labor, two men, fifty-two weeks at $25 per week	2,600.00
Total annual saving	$5,100.00
Annual operating cost of tractor	1,657.30
Net annual saving effected by tractor	$3,442.70

* Allowing for interest earned by depreciation reserve.

Commercial Activities and Public Relations

Store Lighting Improved by Window Contests

By F. C. Eteson
Illuminating Engineer Blackstone Valley Gas & Electric Company, Pawtucket, R. I.

WIDESPREAD improvement in store lighting has resulted from a window dressing and illuminating campaign and contest conducted early this year by the Blackstone Valley Gas & Electric Company in co-operation with the Pawtucket Chamber of Commerce, local merchants and the press. Beginning the first week in January, the company inaugurated a definite plan for concentrating the attention of local merchants upon window displays, the main purpose being the creation of better display effects, thereby placing the merchants in a favorable mood to appreciate the direct connection between good lighting and better displays from the standpoints of adequate and properly applied intensities, special color and spot lighting effects.

A miniature demonstration window 6 ft. long and 4 ft. high, equipped with six 200-watt reflectors and two 200-watt show window flood lights, was placed in one of the company's office windows. The merchants' division of the local Chamber of Commerce was invited to utilize this window to take advantage of a "Main Street" display under proper lighting conditions. Each display was prepared by selected merchants and ran for three days over a period of six weeks. Many merchants reported definite sales increases resulting from the displays. At the end of the demonstration period the window was used at the annual meeting of the merchants' division in connection with a lecture and demonstration upon window dressing by David Morey, instructor in window display, Boston University.

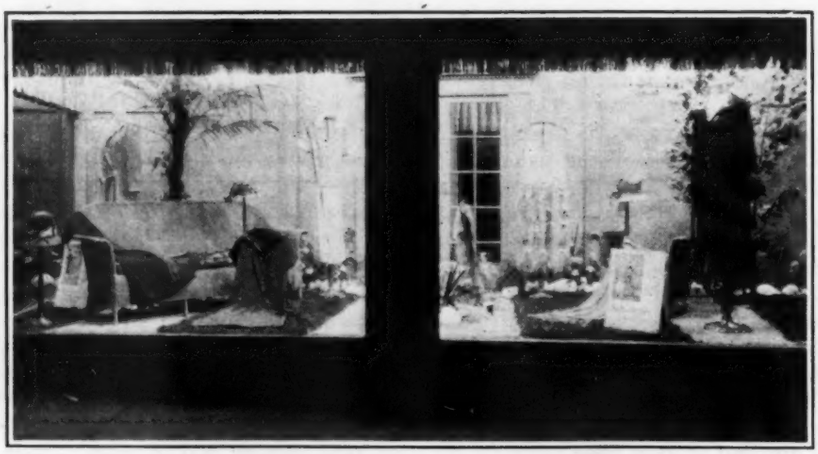
CENTRAL STATION COMPANY'S DEMONSTRATION WINDOW

Chamber of Commerce Sponsors Contest

Late in March a show window contest and style show was held under the auspices of the Chamber of Commerce. The Blackstone Valley company loaned complete lighting equipment to merchants entered in the contest and offered a special lighting prize for the best application of lighting effects in displays. Ten classifications of displays were established as follows: Women's wear; men's wear; shoes; millinery; yard goods and small wear; furniture; housewares; groceries and provisions; gifts; and hardware. Each store was permitted to enter as many windows and as many classes of displays as desired. The illuminating engineering department of the company was placed at the disposal of the merchants in connection with the free use of lighting equipment, advice as to color combinations and supervision of installations. The company did not compete in this contest, but set up the model window for reference.

Ten silver loving cups, one for each of the winners in the ten display classes, were offered as prizes by the retail merchants' division, and two capital prizes of $10 and $15 respectively for first and second places in the contest were also offered. All prizes went to the window dressers and not to the stores. The Blackstone Valley company also offered a $15 prize in the form of a complete spot light equipment for the most novel and effective use of lighting effects in the contest.

The total cost of the display contest to the Chamber of Commerce was $250, each merchant paying $3 for each window entered. The money so appropriated was used for newspaper advertising, identification stickers for windows and incidental expenses. More than sixty windows were entered by thirty-six concerns, and it was estimated that 15,000 persons viewed the displays on the contest night. The permanent results of the contest have been apparent ever since its close in better window and store illumination.



MERCHANT'S WINDOW DISPLAY WHICH WON FIRST PRIZE

New Department for Rural Service Needs

TO ENCOURAGE greater use of electrical apparatus, appliances and other labor-saving devices by rural customers and to offer practical demonstration of this equipment to prospective users, the Wisconsin Gas & Electric Company has formed a new department to be devoted exclusively to handling the electrical needs of the farmer. A complete display of various electrical appliances and machinery suitable for farm use has been arranged in the company's Racine office. A. C. Harris has been placed in charge of the new department.

Effect of Ranges on Load Curve

THE effect of numerous ranges on the load curve of a small city is well shown on the accompanying chart. The city of Galt, Ontario, is one of the municipalities in the Hydro-Electric Power Commission's system and has a population of 13,302. There are 3,500 domestic customers, 120 power customers and 500 commercial customers in the community. Approximately 900 ranges are in use in the town.

A study of the load curves shows that ranges have a noticeable influence on the system. As is customary in many small cities the noon meal is "dinner" and there is a very evident range peak from 10:30 a.m. until 12 o'clock. There is very little diversity in this peak between summer and winter conditions. Another range peak can be noted between 8 a.m. and 9 a.m. One of the most interesting effects of the range load is in the evening. At this time, when the power load drops about 5 p.m., the range load comes on strongly and holds up well until about 6 p.m. Then at about 7 p.m. the full lighting load comes on the system.

The total effect of ranges on a larger system therefore would be to somewhat offset the valley between 5 p.m. and 7 p.m. usually found because power load is off and lighting load is not yet on the system. In the mornings the system load would come on earlier as regards magnitude and an appreciable effect would be noticed at noon. The general effect would be to hold the load for a longer period each day and to give some diversity advantages.

Relation of Appliance Sales to Family Income

Northern States Power Company Has Plotted Appliance Saturation in Minneapolis from Which to Determine Market Possibilities and Direct Sales Programs

HOW the ability of a residential customer to purchase electrical appliances is governed by the size of the family income is strikingly shown by the accompanying map and tabulation used by H. E. Young, sales manager of the Northern States Power Company in Minneapolis, in determining the most productive sections of the city in which to concentrate sales effort on various electrical appliances. These data were compiled as the result of information collected by the company's customer service department, together with a map of Minneapolis prepared by the Minneapolis *Journal* showing various districts of the city classified according to family incomes.

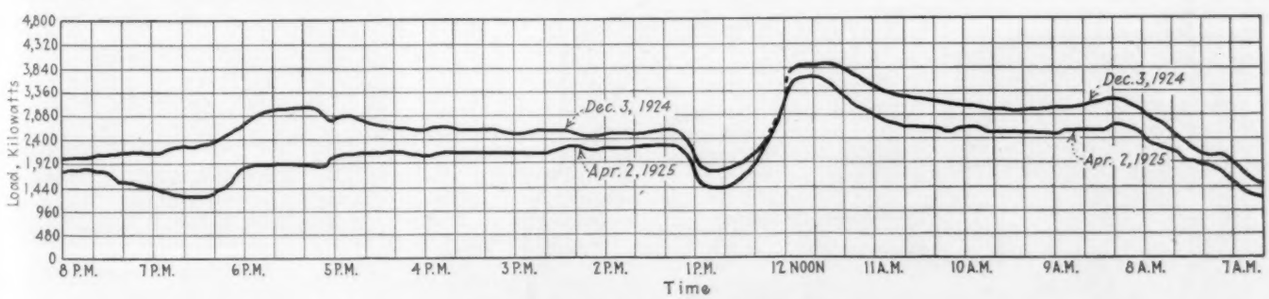
USE OF ELECTRICAL APPLIANCES BY DOMESTIC CONSUMERS DEPENDS ON FAMILY INCOME

	Percentage of Saturation			
Appliance	Family Income $4,000 and Upward	Family Income $2,500 to $4,000	Family Income $1,500 to $2,500	Family Income Less Than $1,500
Irons	97.4	95.2	87.4	80.7
Vacuum cleaners	81.1	75.5	36.9	24.6
Toasters	60.0	55.3	20.9	15.8
Washing machines	56.4	48.2	22.6	12.1
Curling irons	29.0	27.1	12.1	18.4
Portable heaters	27.9	27.5	10.7	14.6
Sewing machine motors	20.1	12.5	2.2	1.1
Fans	20.0	19.3	3.1	1.3
Ironers	16.3	14.1	.4	.6
Percolators	16.3	7.3	.5	.1
Ranges	6.3	.9	.3	.09
Waffle irons	4.7	6.1	.7	.7
Grills	3.4	5.2	.6	.6
Hot plates	3.2	2.4	.5	.3
Miscellaneous	7.0	9.4	1.6	1.3

It will be noted that the city has been divided into five classifications, white indicating the commercial or manufacturing districts and the shaded portions the residential sections. These are divided into districts in which the survey showed that the average family income came within one of the following four classifications: Incomes up to $1,500 per year, $1,500 to $2,500 per year, $2,500 to $4,000 per year, $4,000 and over.

From the record of appliances used by individual customers in these districts, which had been obtained as a result of the company's customer service work, the tabulation showing the degree of appliance saturation in each district was drawn up. With the map and the use of appliances tabulated according to the family income, some striking and significant conclusions may be made.

It is at once apparent that the size of the family income is the governing factor in the number of electrical appliances the central-station company can reasonably expect to sell to a residential customer. Regardless of the ability of persons with larger incomes to employ domestic servants to perform the heavier household duties such as washing and cleaning, the fact remains that the more well-to-do classes of customers are proportionately greater users and better prospects for the



EFFECT OF RANGES ON SMALL TOWN LOAD

Curves for Dec. 3, 1924, and April 2, 1925, for the total load on the town of Galt, Ontario. Range effects can be noticed in the morning, at noon and in the evening. About 900 ranges are installed in a total of 3,500 domestic customers.

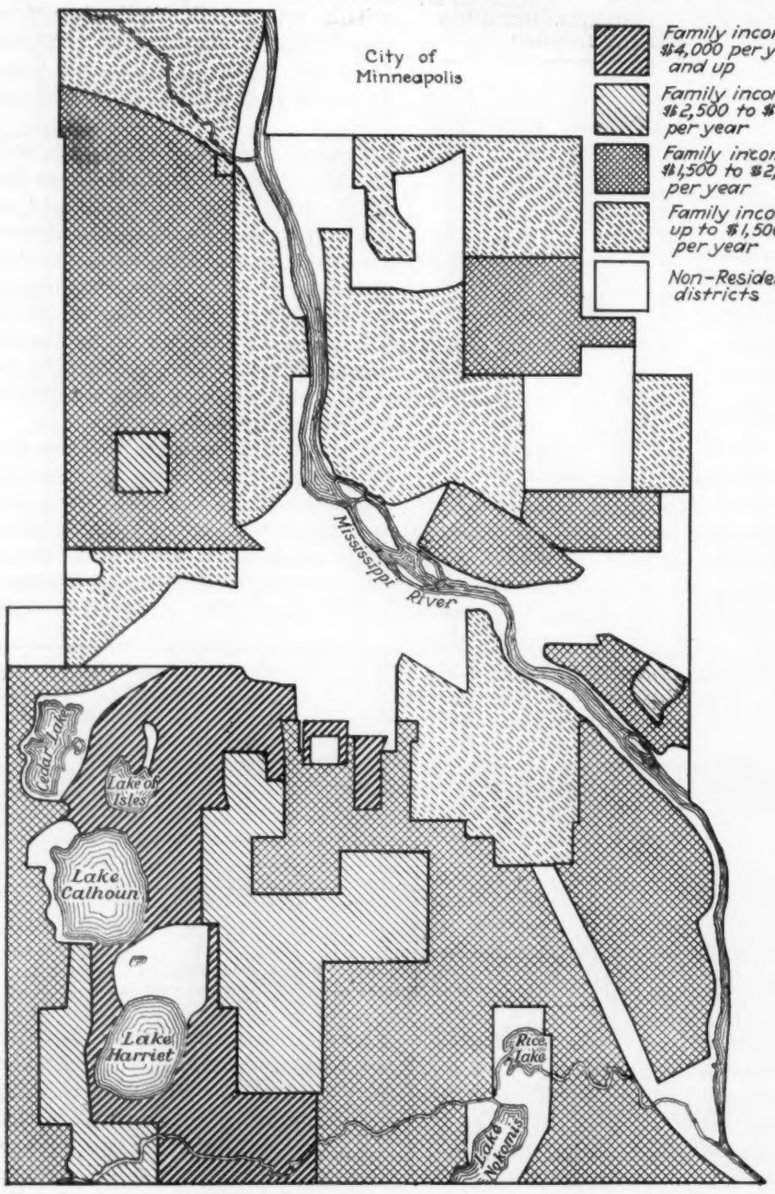
sale of additional electrical conveniences than are those with small incomes. Even the flat iron is found in greatest number in homes of larger incomes.

The degree of saturation for all appliances in the homes of different classifications appears to vary almost directly with the family income. One or two exceptions to this general tendency reflect the habits of the people. Take, for instance, the curling iron and portable heater, each of which is found in a higher percentage of homes of families of the least income than in families of the next higher classifications. The greater use of the curling irons in this case may be explained by the fact that members of such families probably do not patronize the beauty parlor. The considerable use of portable heaters by these customers is thought to be accounted for by the absence of furnaces or heating equipment in all rooms of the house and also perhaps to the greater amount of sickness in such families.

The use of waffle irons and grills by families within the $2,500 to $4,000 group indicates that although few servants are employed these families enjoy and appreciate the convenience of table cookery. The same tendency in the larger number of miscellaneous appliances used by this group seems to be the result of the same influence. The percentages of the other appliances used by customers of the two higher classifications are fairly close together, with the exception of electric ranges and percolators. This would indicate that families with incomes above, say, $3,000, may be considered as A-1 prospects for all electric appliances.

The sharp drop in use of electric ranges from 6.3 by families with incomes of $4,000 and upward to 0.9 by families with incomes of $2,500 to $4,000 is apparently due entirely to the price consideration, although it should be noted that there are a great many more customers in the last-named class than in the former.

As a ready means of market analysis this combination of map and appliance saturation table has proved of great value in estimating the potential sales possibilities in all sections of the Minneapolis territory. The relative sizes of the various income areas serve as a guide to the number of salesmen and amount of time that should be required to conduct a campaign upon any particular device.



SHOWING DISTRICTS CLASSIFIED ACCORDING TO FAMILY INCOMES

Advertising Unwired Houses to Stimulate Business

AN ELECTRIC SIGN that calls attention to the number of unwired houses remaining in town was lately erected by the Hawes Electric Company, Watertown, Mass., to arouse interest in securing an up-to-date electrical installation. This somewhat unusual approach to the subject of house wiring has the effect of making the passerby compare his own home with the great majority of dwellings in the community, and tends to put him in a frame of mind favorable to investigating the cost of modernizing his residence from the electrical point of view.

NUMBER OF UNWIRED HOUSES USED IN ADVERTISING APPEAL

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Recent European Hydraulic Machinery Design.—F. JOHNSTONE-TAYLOR.—While American practice inclines to the use of vertical-shaft turbines for large power plants on falls of about 50 ft., European practice largely favors the twin horizontal type. Propeller-type runners like the Kaplan and Lawaczek have been worked out for highly rated plants. Two such units, with runner diameters of 5.8 m. and 6.0 m. respectively, for 10,000 hp. at 62.5 r.p.m. under a somewhat variable head averaging 21 ft., have been put into the large plant at Lilla Edet, in Sweden. The characteristics of this type in general are that they have a high speed on a comparatively low fall, a high efficiency at normal load—a maximum of 89 per cent was reached during official test with a 2,700-hp. propeller unit at Wynau, Switzerland—and much better efficiency is maintained at reduced power consumption upon reduced head than would be possible with a Francis turbine under similar conditions. British builders are taking seriously the construction of high-head Francis turbines, mostly because of colonial power developments. For the one on the Humberarm, Newfoundland, seven spiral-cased wheels, each developing 14,000 hp. at 375 r.p.m. on a 250-ft. head, have been constructed. They are provided with flywheels because the water passes through 4,000 ft. of pipe and the location is unsuited to a surge tank. Other features recently adopted abroad are a new Pelton governing system, new valves and roller sluicegates. —*Power Plant Engineering*, July 15, 1925.

Soot Deposits in Steam Boilers.—BENGT AFZELIUS.—The author gives a review of the latest figures with regard to the reduction in effective heating surface. He emphasizes the necessity of taking into account the effects of soot deposits in determining the heat drop of the flue gases along the heating surface. Recent investigations of the heat conductivity of soot make this possible.—*Teknisk Tidskrift (Swedish), Mekanik*, July 18, 1925.

Generation, Control, Switching and Protection

Features of the Middletown Station.—To serve the industrial territory from Hanover, Pa., to Dover, N. J., a plant has been constructed on the Susquehanna River near Harrisburg. The ultimate capacity of the plant as designed will be 200,000 kw., of which one unit of 30,000 kw. is now in operation. The river provides not only the necessary condensing water, but has along its bed a supply of anthracite coal that has been washed from the dumps in the mining regions. This is to be dredged, mixed with bituminous and burned in pulverized-fuel furnaces. The article describes the almost completely automatic method of preparing the coal, gives a heat cycle diagram computed for 26,720 kw., based on 350-lb. steam superheated to 600 deg., discusses various features about the plant and presents a summary of the principal equipment. The illustrations include a number of diagrams relating to the mechanical and electrical operation, drawings and views.—*Power Plant Engineering*, July 15, 1925.

Electrical Features of the Somerset Station.—Reference has previously been made to descriptions of the plant as a whole. This article discusses some of the more important electrical features. —*Power Plant Engineering*, July 15, 1925.

Self-Excited Asynchronous Generators.—W. WEILER.—While the theory of this type of generators has been expounded in a great many papers, the author develops a simple physical explanation, employing concrete values and known methods, to investigate the properties of these machines. He considers two types—the asynchronous generator with line-excited exciter (frequency changer) and the compensated asynchronous generator of Osnos. The latter is the more generally used type and lends itself particularly well to small automatic hydro-electric plants, because it does not require a speed regulator on the waterwheel and needs no synchronization to the line. However, tests and experience have shown that the self-excitation of such generators is uncertain and that the voltage regulation requires rather complex apparatus. For these reasons it appears advisable to use such machines only on networks into which a synchronous generator feeds.—*Elektrotechnik und Maschinenbau*, Aug. 9, 1925.

Transmission, Substations and Distribution

Corona Investigation on an Artificial Line.—MURRAY F. GARDNER.—Accompanying corona on a transmission line, there has been found in several cases an appreciable increase in the charging current over that indicated by the usual formula. This has been taken to indicate an increased capacitance resulting from the presence of the corona envelope. The present paper describes an investigation of this extra-capacity effect. To eliminate the glow discharge and all possibility of an envelope effect, the corona leak was simulated by means of a pair of vacuum tubes with a bias potential on the grids, so that current passed only for a short time during the crest of each half wave. It was found possible to obtain the extra-capacity effect without having present an ionized envelope. The author suggests that the larger portion of this effect found on transmission lines under corona conditions is apparent only, being a result of the approximate method by which line capacitance is calculated and the increased admittance which the line offers to currents of harmonic frequencies. From a study of the effect of corona leakage on the potential rise on an open line it appears that the leakage plays a predominant part in the establishment of the resultant voltage, the harmonics not producing unusual resonance effects. Qualitative results showing the effectiveness of corona leakage in reducing traveling waves were obtained by oscillograms of the same transient, with and without the corona leaks. In the latter case the duration is much shorter.—*Journal A. I. E. E.*, August, 1925.

Grounding of the Neutral in Three-Phase Transformers with Siren in the Grounding Circuit.—FRITZ JACOBSSON. —The author discusses the use of a siren of membrane type connected to the secondary of a transformer in the grounding circuit. It is pointed out that the usual trouble with these sirens —dying out of the noise after a few seconds—has been due to overheating of the membrane and can be prevented by giving the siren a sufficient capacity. —*Teknisk Tidskrift (Swedish), Elektroteknik*, June 6, 1925.

Units, Measurements and Instruments

The X-Ray Examination of Steel Castings.—I. E. MOULTROP and E. W. NORRIS.—This is an abridgment of the paper read before the A. S. M. E. at the spring meeting and published in *Mechanical Engineering*, to which reference has been made in an earlier issue of the Digest.—*Engineering (England)*, July 17, 1925.

Measurement of Slip.—R. VIEWEG and H. E. LINCKH.—The most frequently employed method to determine the slip of motors is the stroboscope, which, however, gives readings not exceeding 8 per cent in accuracy. The method gives, furthermore, only average values during the measuring period, while it is frequently required to get instantaneous values. Another method uses small tachometer dynamos, in which case the voltage variations due to the unavoidable commutators and brushes prevent high accuracy. The authors devised and described in this paper a method wherein two very small unipolar dynamos having mercury cups for current collection are used. These small dynamos deliver about 10 millivolts per 1,000 r.p.m. and consume from 0.5 watt to 7 watts of mechanical energy for their drive. Readings with accuracies to 0.05 per cent can readily be made even for momentary slip conditions. In an appendix to their paper the authors describe an accurate, simple but little known stroboscopic method to determine speed of rotation by using a combination of neon lamp and tuning fork.—*Elektrotechnische Zeitschrift*, July 23, 1925.

Illumination

Measurements of Natural Light During the Solar Eclipse of January.—This paper embodies the results of observations by fourteen parties stationed along the path of totality from Hamilton, Ontario, to Montauk Point, Long Island. The majority of the measurements were obtained by visual methods, with commercial types of photometric apparatus. One of the observers used, in addition, a photo-elec-

tric cell. Readings were made at short intervals throughout the entire period from first contact through totality to final contact, occupying a period of two and a half to three hours. Each party secured data on one or more of the following: (a) Normal illumination due to sun or corona; (b) sky brightness at various angles in altitude and azimuth; (c) horizontal illumination. The presentation of the measurements as reported is followed by some studies to disclose the characteristics of the data obtained and finally by an approximation of representative values derived from all of the measurements. The normal illumination due to corona appears to have been in the vicinity of 0.012 foot-candle. Sky brightness varied widely, depending on the portion of the sky viewed, during totality as under ordinary conditions, but was, of course, far feebler, being of the order of 0.15 toward the zenith, whereas it rose to 500 millilamberts or higher when the sun was completely uncovered. At virtually all times the zenith seems to be the least bright part of the sky. The data on horizontal illumination are the most concordant and point to a value around 0.24 foot-candle during totality. This may be compared with 0.014 for full moon, obtained two weeks later by one party under similar conditions, or of 0.030 foot-candle, the probable maximum illumination on a bright moonlight night. A notable characteristic was the extremely rapid decrease in illumination, from 1,000 foot-candles to the minimum in perhaps twenty minutes and from 100 to the minimum in three minutes, with a corresponding increase afterward. Appendices by various authors include a study of photometric measurements during earlier eclipses, a discussion of observations on shadow bands, a determination of relative brightness of various portions of the sun's disk and a rather full review of photographic results.—*Transactions I. E. S.*, July, 1925.

Motors and Control

Extra Losses in the Windings of Alternating-Current Machines.—J. WENNERBERG.—This article is a continuation of previous articles on the same subject and deals with the eddy losses in conductors installed near the iron. The theoretical investigations are checked by experiments, and the results are presented in a convenient practical form.—*Teknisk Tidskrift (Swedish), Elektroteknik*, June 6, 1925.

Automatic Synchronizer.—G. SARTORI.—Assuming that the voltage and the frequency of a synchronous alternator or motor have been brought up to the corresponding values of the line to which it is about to be connected, the apparatus described will automatically close the main switch at the instant of exact phase equality. The apparatus consists of a fractional-horsepower motor, connected to the line, driving a small oil pump. The oil pressure keeps the piston of a servo-motor down against the action of a spring. Between pump and servo-motor is interposed a valve operated by a phase meter. When equality of phases is reached this meter will close the oil valve, and the spring in the servo-motor will throw the piston in the oil cylinder in the upper position, causing the closing of a contact, which in turn closes the main switch. Tests on this device were very satisfactory.—*Revue Générale de l'Electricité*, July 18, 1925.

Balancing of the Centrifugal Forces in Rotating Machinery.—C. RICHARD SODERBERG.—A general review of the balancing problem, available types of balancing machines and the theoretical principles of the modern balancing machine.—*Teknisk Tidskrift (Swedish), Mekanik*, July 18, 1925.

Heat Applications and Material Handling

Determination of the Heat Conductivity of Ashes and Soot Deposits.—G. BORELIUS and ARTUR ERIKSON.—An investigation of the heat conductivity of eight different kinds of ashes, soot and dust from steel furnaces and steam boilers. It is found that the conductivity is a function of the temperature, the specific volume of solid substance and the specific weight.—*Teknisk Tidskrift (Swedish), Mekanik*, July 18, 1925.

Survey of Representative Materials Handling Practice in Modern Plants.—MATTHEW W. POTTS.—More than fifty pages are devoted to a group of illustrated articles describing the handling of materials in six representative, nationally known establishments.—*Industrial Management*, August, 1925.

Welding Machine.—M. CURSTÄDT.—For light spot-welding jobs a new electric welder is available on the German market. The new feature of the machine is the complete reversal of the rôles usually taken by copper and iron. In this design the main body of the welder is the low-voltage turn. Being made hollow, the high-voltage turns are lodged within it. A package of iron laminations surrounds one side of the machine frame, acting as the "core" of the transformer. Such an arrangement is asserted to lower very considerably the internal resistance of the welder, so that the ratio between resistance of the job and the resistance of the welder becomes very favorable. Six voltage taps permit a regulation of the low voltage to suit various jobs.—*Elektrotechnische Zeitschrift*, July 30, 1925.

Traction

Southern Railway Electrification.—The first section of the suburban lines of the Southeastern and Chatham sections of the Southern (England) Railway has recently been converted to electric traction, power being obtained from the Deptford station of the London Electricity Supply Corporation at 11,000 volts, 25 cycles, three-phase, and changed to direct current in twenty-one substations containing in the aggregate fifty 1,500-kw. rotary converters. For signaling and lighting 75-cycle single-phase current is used. An interesting feature, in the light of American practice, is the use of tungar rectifiers to charge the substation batteries. Trains are operated on the multiple-unit system. The article describes particularly the substation equipment—machinery, control, and switchgear. A map, diagram of the feeder layout and illustrations are included.—*Electrician (England)*, July 24, 1925.

Telegraphy, Telephony, Radio and Signals

The Leafield Coupled Arc.—A. G. LEE and A. J. GILL.—The object of introducing a coupled circuit in connection with a Poulsen arc was to reduce the disturbance to other wireless users on wave lengths far removed from that of the arc caused by the presence of harmonics and "mush." From a consideration of the probable cause of these disturbances it was expected that they could be to a great extent eliminated if a primary oscillating circuit were provided in which the inductance and the capacitance were both concentrated, since the antenna system, in which these quantities are distributed, of necessity has harmonic resonance positions. Technical problems arose in connection with the design of the high-voltage, high-capacitance condensers which called for experiments on oil and the design of special bushings and insulators. It was found, for instance, that by centrifugal dehydration a normal power factor of 0.0003 in commercial oil can be lowered to 0.00005. A freezing constituent had no appreciable effect on power factor. Heating the oil after plain dehydration caused a material improvement in dielectric strength. Although a coupled circuit has two natural frequencies, it was found that the arc will oscillate on only one of them because the extinction period of the arc forms a discontinuity which can fit only one cycle of operations. The explanation of this characteristic is developed at some length. It is worth noting, in view of the known unsteadiness of the arc on plain aërial excitation, that coupled-circuit working gave remarkable steadiness of the frequency.—*Journal of the I. E. E.*, July, 1925.

Miscellaneous

Electricity in Agriculture.—Under the title "The Royal Agricultural Society's Show," there is to be found a description, with illustrations, of a variety of exhibits involving the use of electricity. One of these was prepared by the agricultural engineering department of Oxford University and showed the application of electric power to the artificial drying of crops. Other exhibits included an electrically heated steam sterilizing equipment, time-switch-controlled poultry house lighting and a windmill electric generating plant with battery, besides motor-driven agricultural machinery.—*Electrician (England)*, July 17, 1925.

The Influence of Lake and River Regulation Upon Neighboring Industrial Regions.—CARL KRISTOFFERSON.—This article was written in an attempt to establish more definite rules for evaluating the economical effects of water-level regulation upon industries that are more or less directly affected.—*Teknisk Tidskrift (Swedish), Väg- och Vattenbyggnadskonst*, July 25, 1925.

News of the Industry

New Englanders Discuss Live Topics

Connecticut Men Tell of Success of Compound Rates in Their State—Improved Public Relations Reported—Servicing Appliances—Power-Factor Correction

WITH welcoming addresses by Governor J. H. Trumbull of Connecticut, National President J. E. Davidson, Executive Manager M. H. Aylesworth and Divisional President Fred H. Smith, the seventeenth annual convention of the New England Division, National Electric Light Association, opened on Tuesday evening of this week at the Hotel Griswold, New London, Conn. The program covered a wide range of subjects in the commercial, public relations and accounting fields, and virtually an entire session was devoted to the problem of power-factor correction.

A feature of the convention was a discussion of compound rates and their success in Connecticut by C. L. Campbell, treasurer Connecticut Light & Power Company, Waterbury, and Samuel Ferguson, president Hartford Electric Light Company. Mr. Campbell pointed out the success of the area and energy charge rate since its initial application ten years ago. Sales per residence customer increased 44 per cent in kilowatt-hours and 22 per cent in revenue from 1919 to 1924, despite a 96 per cent gain in the number of customers. The average rate is now 15 per cent lower than in 1914. Per-customer residence sales in 1919 were 221 kw.-hr., and in 1924 these were 318 kw.-hr. The rate is made up of a 50-cent monthly charge plus a demand charge of 4 cents per 100 sq.ft. of floor area per month plus an energy charge of 5 cents per kilowatt-hour. An optional rate has been adopted this year of $2 per month plus 8 cents per 100 sq.ft. plus 3 cents per kilowatt-hour to encourage electric cooking. The popular reaction to the combination rate has been most favorable.

MR. FERGUSON'S STORY

Mr. Ferguson told the story of the adoption of the two-part rate at Hartford and cited its cordial reception by the public in the face of sentiment adverse to a gas service charge. The Hartford rate is now 50 cents per 100 sq.ft. of floor area per month plus an energy charge of 5 cents per kilowatt-hour. A higher area rate and a lower energy rate would have been established had the company realized the extent to which the two-part rate was to succeed. This rate saves $60 per customer in extra metering and wiring as compared with a straight-line meter rate for residential power service, or a $3,000,000 investment if applied to Hartford's fifty thousand customers. Use of appliances is stimulated, and the Hartford public has virtually forgotten the existence of the area charge.

In the first year five thousand customers of the dead-wood type increased their use of electricity 60 per cent, and three-fourths of these were earning a rate below the former 10-cent rate. The rate has now been in use three and one-half years, and the residential use of electricity has increased 27 per cent per customer. For the first seven months of this year it averaged 207 kw.-hr. against 163 kw.-hr. when the rate began. A comparable neighboring city of about the same customer density on a straight-line rate gained from 172 kw.-hr. to 192 kw.-hr., or only 11 per cent, in the same period. The average residence receipts are now 7.4 cents per kilowatt-hour and the revenue per customer has increased 8 per cent at Hartford since the rate began.

Improving public relations were reported by many speakers, and the public relations aspects of merchandising and of rural-service development were stressed. Dr. E. A. White, Chicago, outlined the work of the National Committee on the Relation of Electricity to Agriculture at the opening session Tuesday, and on Wednesday F. A. Belden described the co-operative work in this field now in progress in New Hampshire under the direction of W. T. Ackerman.

Robert M. Davis, statistical editor ELECTRICAL WORLD, gave an illustrated lecture upon industrial power development in New England on Wednesday morning which is published elsewhere in this issue. Frank E. Watts, New York, manager "Electrical Goods" section of the *Hardware Age*, gave an address urging central stations to adopt a policy of servicing all appliances.

J. F. Becker, chairman of the industrial lighting committee of the N. E. L. A., and M. C. Turpin, Westinghouse Electric & Manufacturing Company, called upon the utilities of New England to share in this movement.

On Thursday L. W. W. Morrow, managing editor ELECTRICAL WORLD, opened the power-factor session with an illustrated paper upon corrective methods. A discussion followed.

An excellent summary of the proposed simplified lamp program was given by Henry Schroeder of the Edison Lamp Works, Harrison, N. J. Data on recent electric vehicle and industrial truck sales were presented by E. S. Mansfield, Boston.

The convention closed with a public relations session on Thursday evening. Attractive entertainment and sports were enjoyed during the week, including an excellent musical program and a baseball match between the Boston and Providence companies.

North American to Acquire Western Power

Will Add to Its Holdings in Middle West Territory the Central California Properties United by H. P. Wilson Less than a Year Ago

ONE of the largest transactions involving the absorption of one public utility holding company by another yet consummated in this period of sales and mergers was made public early this week, when H. P. Wilson, president of the Western Power Corporation, admitted the acquisition of that company by the North American Company. It will be remembered that only last December the Western Power Corporation, which had long been in control of the Great Western Power Company of California, added to its possessions the San Joaquin Light & Power Corporation and announced an ambitious program of expansion. The North American Company, controlling the principal electric light and power properties in St. Louis, Cleveland and Milwaukee, owns also many smaller ones in Wisconsin, and other Middle Western states and has a substantial though not a controlling interest in the Detroit Edison Company. This is its first excursion to the Pacific Coast, where it will now have an important foothold.

The gross earnings of the Western Power Corporation and its subsidiaries for the twelve months ended July 31 were almost $17,000,000. For the twelve months ended June 30 the North American Company reported gross earnings of $82,941,903. The transaction under notice will consequently mean an increase in gross business for the North American Company to $100,000,000 or more annually.

The basis of the acquisition proposed and which is expected to be carried through includes an exchange of Western Power Corporation common stock for North American common stock at the rate of one and a quarter shares of North American for one of Western Power. Western Power stockholders are to have the option of taking cash at the equivalent of $75 a share.

The operating properties acquired in California have an installed generating capacity of 420,500 hp., of which 298,500 is hydro-electric and the rest steam. The hydro-electric properties are estimated to have a potential development of about 1,250,000 hp., including the power developable on Kings River.

Davidson Talks About the N. E. L. A.

New President of National Body, in Address Broadcast by Pennsylvania Electric Association, Describes Functions and Achievements of Organization

REGISTRATION and other preliminaries occupied the first day of the annual convention of the Pennsylvania Electric Association, as the Eastern Geographic Division of the National Electric Light Association, which comprises New York and New Jersey as well as the Keystone State, continues to be called. This convention met at Bedford Springs, Pa., from Wednesday to Saturday of this week. The most important event up to the time the ELECTRICAL WORLD went to press was the public policy meeting on Thursday evening, of which the proceedings were broadcast by radio. Here President J. E. Davidson of the national body made a notable address full of information for the layman on the functions and the achievements of the association which he heads.

Mr. Davidson dwelt on the fact that the electric light and power industry is publicly regulated and has nothing to conceal. There is, he said, great tolerance of opinion among engineers and operators and, owing to the absence of sordid motives and unworthy aims, differences are quickly composed on the assumption that the public welfare is the first interest of all. The man in the street is prone to class the National Electric Light Association with the ordinary trade association and to suppose it organized to boost prices and exploit the public. On the contrary, Mr. Davidson declared, the association "stands for the broadest and most untrammeled development of the art of applied electricity, for the maintenance of incentive to inventor, engineer and capital in such development, for the protection of the savings of the investor in the electric light and power business, for the welfare of the employees of the industry, and, above all, through these principles and motives, for the best service and the fairest dealings to the public."

The association, Mr. Davidson said, has lent its support to the conservation of energy and of natural resources and has consistently favored regulation by commissions, realizing the advantages so derived, although in every industry other than a public utility the law of supply and demand has full sway. He sketched the governing organization of the N. E. L. A. and showed how its flexibility insured progressive development and initiative, praising the work of the five hundred committees and subcommittees of the national body, its four sections and its geographic divisions. In the "safety first" movement, in the formulation of a national water-power policy, in pointing the way to take electric service to the farmer, in co-operation with other engineering bodies to promote standardization, in research in many fields, the association has done valiant work, Mr. Davidson maintained, alluding among other matters to its co-operation with the communication interests to promote inductive co-ordination on parallel power and communication lines and to the national home-lighting campaign of 1924 in which it played a leading part.

The impetus given by the committees of the N. E. L. A. to progress in the manufacture of electrical machinery, the great economies achieved by interconnection and the accomplishments of the committees on customer ownership and on relations with financial institutions were also dwelt upon by Mr. Davidson, who pointed once more to the fact that while the average cost of all commodities taken together is still 65 per cent above the cost in 1913, the cost of electricity to the ultimate consumer has decreased approximately 8 per cent since the war.

The association, Mr. Davidson showed, had been of inestimable help to companies operating in small communities by its provision of expert advice and promotion of the use of electrical appliances. For instance, the association's insurance committee had effected savings in premiums greater than the annual dues of the company concerned.

As in Napoleon's army, every private in the industry carries a marshal's baton in his knapsack, declared Mr. Davidson in conclusion. Its leaders for the most part have risen from the ranks. Leadership, however, must be developed, and it is its work in bringing forward men of promise, ability and integrity that has given the association its position of prominence and respect.

Muscle Shoals Commission Will Meet October 1

The President's Muscle Shoals Commission has been called to meet on October 1 and will remain in continuous session until its report is completed. The commission, which is to make recommendations for the final disposition of the government's property at Muscle Shoals, is composed of former Representative McKenzie of Illinois, chairman; former Senator Dial of South Carolina, Prof. H. A. Curtis of Yale, William McClellan, consulting engineer, New York, and Russell F. Bower of the American Farm Bureau Federation.

Great Lakes N.E.L.A. Prepares Program for French Lick

Although the detailed program for the annual convention of the Great Lakes Division, N. E. L. A., to be held jointly with the meeting of the Indiana Electric Light Association at French Lick Springs, Ind., September 23-26, is not yet out of the printer's hands, advance information of its contents shows that the proceedings will be in every way up to the high standard set for geographic division conventions. Among the many well-known men of the industry who will participate are President Davidson and Managing Director Aylesworth, of the N.E.L.A.; M. S. Sloan, president Brooklyn Edison Company, and John F. Gilchrist, vice-president Commonwealth Edison Company. Sherman T. Handy, of the Michigan Public Utilities Commission, and Prof. G. T. Christie, of Purdue University, will make addresses. Timely subjects that will come up for review include such matters as free premiums, contract and application routine, portable electric tools as income producers, electric truck transportation, operation of large generating systems, Diesel and oil engine competition, carrier-current telephony, regulation of 4,000-volt distribution systems, inductive co-ordination and rural-line construction.

There will be entertainment for visiting ladies embracing horseback riding, golf, tennis, cards and dancing. Special railroad rates have been arranged, and special trains will run from Chicago on the nights of September 22 and 23. The annual banquet will be on Thursday evening, September 24.

Differ About Farm Service

Wisconsin Men Find that Conditions Vary—Other Topics at Green Bay Utilities Convention

SERVING the farmer, although only one of five general subjects considered at the Green Bay (Wis.) convention of the Wisconsin Utilities Association's Electric Section on September 4 and 5, elicited most interest so far as discussion showed. Different phases of power-factor correction ran a close second, with safety methods, hydro-electric development and operation and live-line maintenance rounding out the program.

Plans for rural extensions by the light and power companies which would require the expenditure of many million dollars were discussed in the report of the committee on rural service, and every speaker—and all the major electric utilities of Wisconsin were represented—expressed a keen interest in aggressively extending service to the farm, all of the companies having already provided service to many farmers. The speakers agreed that the consumption on farms will have to be increased considerably to make it a profitable business, but it was conceded that, as one speaker put it, "utilities should take skimmed milk with the cream."

Various differences of opinion were evidenced regarding the methods of financing such lines and charging for service. These differences were apparently due to unlike attitudes of the farm population in different territories. Some delegates favored letting farmers pay for and build the lines under utility supervision and then turn them over to the utility so that rates can be offered that do not include fixed charges on cost of construction. Others favored utilities financing the lines and including fixed charges in rates. Objection to a rural charge plus the rates of the community from which energy is delivered was quite generally voiced because of the difference in rates which might be charged adjacent farms as extensions increase. The necessity of helping farmers finance the purchase of utilization equipment which will build a large consumption was recognized by every one, some preferring to aid by relieving the farmers of the

expense of financing lines, others by permitting time payments on utilization equipment. Among those who expressed their views were R. G. Walter of Madison, chairman of the rural service committee; G. V. Rork of Owen, Frank Coffin of Milwaukee and G. H. Wilmarth of Eau Claire.

G. C. Neff of Madison declared emphatically that the imperative need of the hour is for each utility to hire a man to supervise rural service, to survey requirements, plan systematically and build up an income proportionate to investment. To do the latter he favored a high fixed charge and a low energy charge as more conducive to large consumption. In building farm lines he favored using farm labor, to leave farmers money with which to buy utilization equipment.

E. R. Meacham of Madison emphasized the need of studying the psychological situation on the farm as well as the cost and production benefits of electric service. He cited some unit costs and described general-utility motors that can be used for various purposes.

Power Factor and Safety

Power factor was discussed by E. S. Schrank of Oshkosh, E. J. Kallevang of Madison, E. H. Finkelnburg of Winona and G. G. Post of Milwaukee. Mr. Schrank compared power factors on different feeders at different times of day, explaining differences and suggesting that such analyses be made more extensively. Mr. Kallevang considered chiefly the effect of power factor on voltage regulation, citing results and comparing methods of alleviation. Mr. Finkelnburg recommended studying the reactive current drawn by each feeder and then individual loads to determine where correction is most needed. Correction near source was urged, ameliorating methods being compared. Mr. Post showed graphically the effect on Milwaukee's power factor of installing corrective equipment.

Increasing electrical safety was discussed from an organization viewpoint by Mr. Post and from an equipment angle by Mr. Kallevang and A. G. Carson of Green Bay. Mr. Post explained the Milwaukee safety organization in detail, stressing the point that codes devote more attention to apparatus than to the human element or to methods of operation. Various tools that facilitate line safety were considered by the other speakers. A. R. Frahm of Eau Claire explained the live-line maintenance tools used by his company.

At the close of the business sessions of the convention and before an inspection tour of hydro-electric developments on the Peshtigo River, Charles V. Seastone, consulting engineer, reviewed recent advances, discussed stream flows and duration curves and pointed out features of these plants, all except one of which have automatic control and supervisory indication and control.

George G. Post, who is electrical engineer of the Milwaukee Electric Railway & Light Company, was elected chairman of the Electric Section for the coming year, and R. G. Walter, Wisconsin Power & Light Company, vice-chairman. John N. Cadby continues as executive secretary.

Georgia Railway & Power Hopes to Avoid Shutdowns

Although the present drought in north Georgia is the worst suffered in many years and water supplies for hydro-electric power are everywhere low, it is not expected that any shutdowns will be forced upon cotton mills and other manufacturing enterprises. The Georgia Railway & Power Company has enough water to supply power for from 80 to 100 days if economical use is made of it. By that time the fall rains are expected to set in.

The power company's request that cotton-mill operators and other manufacturers served by it conserve power by running at night instead of in daytime, as much as possible, running on Saturday afternoons, and on Sundays if necessary, in order to conserve the hydro-electric power and utilize the steam power of the company to best advantage, has met with a 99½ per cent response on the part of manufacturers.

Power from Alabama and other states is coming into Georgia for this night work, and it is expected that the drought will break at least a month before the situation becomes critical.

Culpeper, Va., Votes Down Proposed Municipal Plant

On Tuesday the voters at Culpeper, Va., defeated by a majority of two to one a proposal to issue bonds in the amount of $125,000 to build a municipal electric light and power plant. Such a plant would have entered into competition with the Virginia Northern Power Company, which now serves Culpeper as well as Warrenton and Orange.

Local League Movement Growing Fast

Sixty-five Active Electrical Associations and Many Cities Awaiting Organization Send Delegates to Fifth Gathering at Association Island, N. Y.

GROWTH of the local league movement in electrical industry was evident this week at Camp Co-operation V, the annual league conference held at Association Island, Henderson Harbor, N. Y. Representatives of sixty-five active electrical leagues and many cities where league organization is under contemplation were in attendance, and an exceedingly comprehensive program was presented. About two hundred and fifty men and women attended, drawn very evenly from the four branches of the industry and hailing from nearly all parts of the United States and Canada. The meeting extended from Tuesday through Friday with a special conference of league secretaries and secretary-managers scheduled for Saturday morning.

The program was opened by a flag raising on the parade grounds with an address by Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, on "The Spirit of the Island," under which head he included some practical aspects of co-operation.

The vital importance of organized local co-operation among electrical men was emphasized by W. W. Freeman, president of the Society for Electrical Development. The time has come, he said in his address of welcome, when the electrical industry has reached a point in its development that requires and demands a consideration of interests and activities, and it is no longer possible for any one local branch of the industry "to hog it all." The league, Mr. Freeman insisted, has become an essential instrument in market building and in service.

Some of the legal aspects of the "red seal" plan were presented by Francis R. Neagle, general counsel for the S. E. D. In a broad discussion of the practical problems of licensing leagues for the local application of the "red seal" program at the Tuesday evening session, Earl E. Whitehorne, as vice-chairman of the League Council, speaking on the status of the leagues today, analyzed an elaborate chart of present league activities that was on display. There are at present 122 leagues in active operation, including eight state or provincial leagues. Of these twenty-eight are "Class A" leagues that maintain a headquarters and paid staff and engage in promotional activities, seventy-nine are "Class B" leagues that engage in business promotion in charge of committees without a paid staff, and fifteen are "Class C" leagues that function only as luncheon or social clubs. The extent of the field service which is being rendered to leagues by the Society for Electrical Development is shown by the fact that eighty-five leagues were personally visited by field men within the last twelve months and in some cases as often as eight times.

The formal written papers on the program were arranged to provide what amounts to a complete manual for leagues, including such subjects as "Organizing a League," by K. A. McIntyre of the S. E. D.; "Planning and Managing the League Activities," by J. E. North of Cleveland; "Keeping League Supporters Informed," by S. W. Bishop of Denver, and a symposium on the social side of the league activities.

The importance of league support for the establishment of a uniform electrical ordinance was presented by S. L. Nicholson of the Electrical Manufacturers' Council, and the National Electrical Code was discussed by W. J. Canada, representative of the National Fire Protection Association, and O. Fred Rost of the Electrical Supply Jobbers' Association. P. L. Thompson, speaking for the advisory publicity council, presented the national aspects of league work.

Consideration of the program of the "red seal" plan, the function of the League Council and a special meeting to discuss "What Women Want to Know About Electricity in the Home," under the leadership of Miss Katharine O. Fisher, director of the Good Housekeeping Institute, were scheduled for later meetings.

Stone & Webster Activities

Another Texas Property Absorbed—Construction in Lone Star State, Illinois and Florida

THE Eastern Texas Electric Company of Delaware, through its subsidiary the Gulf States Utilities Company, a newly organized corporation, has taken over the utility service in Orange, Tex. The Eastern Texas company is under the executive management of Stone & Webster, Inc., Boston. The company will serve the city of Orange, the villages of Vinton, Ged, Edgerly and Sulphur, the Orange, Vinton, Ged and Edgerly oil fields and a large irrigation pumping load in the vicinity of Orange. There is a 12,000-hp. oil-burning steam station at Orange. A 62-ton ice plant is operated and a waterworks supplies over 1,400 water customers. The gross earnings for the year ending April 30, 1925, were over $500,000, 81 per cent of which was electric.

This property is the second acquisition of the Eastern Texas Electric Company within the last few weeks, the Western Public Service Company of Colorado having been purchased on August 12, as reported in the ELECTRICAL WORLD for September 5, page 481.

CONSTRUCTION UNDER WAY

Recent activities of the engineering and construction division of Stone & Webster include work which has been awarded or is under way in the central-station field in Texas, Illinois and Florida. A power station of 300,000 kw. ultimate capacity is being designed and built for the Eastern Texas Electric Company on the Neches River about 4 miles below Beaumont, Tex. The initial installation will include one 25,000-kva. main generator with a 1,250-kva. auxiliary generator and exciter driven by a single steam turbine of the extraction type for the regenerative heating of feed water. The installation will also include an outdoor switching station designed for an initial layout of one transformer bank stepping up from 13,200 volts to 33,000 volts and 66,000 volts. One 66,000-volt and four 33,000-volt lines will be installed at present, distributing energy to Beaumont, Liberty and Arthur, and interconnection with the newly acquired property at Orange will be made.

A contract has been awarded to Stone & Webster by the Southern Illinois Gas Company for an extension of its electric generating plant at Murphysboro, Ill., calling for 2,200 kw. in turbine units, additional boiler capacity and rebuilding of the boiler-house superstructure, which was destroyed by tornado. The Tampa (Fla.) Electric Company is to install two 665-hp. boilers, extending the boiler house and fuel-oil piping.

Halifax Power Company Expands Virginia Operations

Development of commercial electric power in southern Virginia has received an impetus from the operations of the Halifax Power Company of South Boston, Va., which is owned by Ira Vaughn of Philadelphia. Small plants, both steam and hydro-electric, with a total valuation of $3,000,000, have been purchased in various townships from Emporia to Chatham. Among these are the plants at Emporia, Victoria, Chase City, Blackstone, and Brookneal. These plants are now being interconnected and will be supplied eventually from two central generating stations to be built on the Staunton River at Brookneal. Some of the plants have already been taken over and are being operated by the Halifax Power Company, and others are to be included by October 1.

The Halifax Power Company's lines will be connected with those of the Virginia Railway & Power Company at Roanoke Rapids, this company having agreed to purchase all electric power generated by the Halifax Power Company in excess of its own requirements. The Virginia Railway & Power Company has also contracted to furnish power to the Halifax company upon demand. The necessity for this extension is shown by the fact that the Halifax Cotton Mills at South Boston have been forced to close down temporarily as the result of the drought, there being insufficient power to operate the plant, which cannot resume until there is a rainfall or the power company can make a connection with the Virginia Railway & Power Company's lines, as it is bending every effort to do.

Effort to Speed Up Hearings on Conowingo Plant

The Maryland Public Service Commission, through a letter from its president, has asked the Pennsylvania Public Service Commission to set an early date for another intercommission conference on the regulation of interstate public utilities. While the primary object of such a conference would be to expedite, in association with the Federal Power Commission, the long-delayed hydro-electric development at Conowingo, Md., it is believed that the entire question of regulating interstate public utilities will be discussed when the commissioners get together. In addition to the Conowingo project, this would involve regulation of the Pennsylvania Water & Power Company of Holtwood, Pa., which supplies Baltimore with power, and of several other power companies entering Maryland from Pennsylvania.

Considerable interest is attached to the probable effects of such a conference on the tripartite agreement between the Consolidated Gas, Electric Light & Power Company, the Pennsylvania Water & Power Company and the United Railways, in connection with hydro-electric power rates.

An answer to the petition of the Pennsylvania Water & Power Company for an injunction restraining the Susquehanna Power Company from constructing a dam with a crest elevation of more than 100 ft. on the Susquehanna River below Holtwood will be filed in the United States District Court at Baltimore by the Susquehanna company within a few days. Unless final attempts at a settlement of differences between the two power interests at conferences are successful before the answer is filed it is believed that a legal battle involving property rights for more than 20 miles on the Susquehanna River and extending to state and federal jurisdiction over exploitation rights will follow. Such a suit, however, would not prevent commission proceedings.

New Insull Holding Company for Southwest

Formation of the Central & South West Utilities Company has been announced by Martin J. Insull. The new company will be controlled through ownership of all of its common stock by the Middle West Utilities Company, and in turn it will own substantially all of the common stock of the American Public Service Company, the Public Service Company of Oklahoma, the Chickasha Gas & Electric Company, the Central Power & Light Company and the Southwestern Securities Company, which controls the Southwestern Gas & Electric Company. These five subsidiary companies, each of which is a major public utility company, serve an extensive territory, including 209 cities and towns with an estimated population of 1,086,312, in the states of Texas, Oklahoma, Louisiana, Arkansas, Kansas and Mississippi. Additional communities are served by these companies under wholesale contracts.

The larger cities served by the subsidiaries of the Central & South West Utilities Company include Shreveport, La.; Texarkana, Tex.-Ark.; Beaumont, Houston, San Antonio, Marshall, Abilene, Laredo and Corpus Christi, Tex.; Emporia, Kan.; Tulsa, Chickasha, Okmulgee and Guthrie, Okla., and Gulfport, Biloxi and Natchez, Miss.

Briefer News

Cleveland to Vote on Expansion of Municipal Plant.—Despite adverse recommendations made by a Cleveland citizens' advisory committee, headed by former Congressman Paul Howland and composed of representatives of various civic and business organizations, the Cleveland City Council has approved a bond issue for $500,000 for additions to the Cleveland municipal light plant, mainly in the Brooklyn station. This proposed bond issue, with various other issues, will be submitted to the voters of the city on November 3.

New Steam Plant to Be Built by Los Angeles.—The Board of Water and Power Commissioners of Los Angeles has instructed Chief Engineer E. S. Scattergood of the Bureau of Power and Light to prepare plans and specifications for a steam plant. This plant is to be a standby station to insure against interruptions in service in case of outages on the transmission lines supplying the city's distribution system. No details as to the type of plant to be erected are available at the present time.

Work Starts on New Steam Plant for Baltimore.—In order to keep pace with the demand for power at Baltimore, the Consolidated Gas, Electric Light & Power Company has started to build

the steam generating plant planned some time ago for the company's water-front property at Gould and McComas Streets. The new station will begin generating a year from now and will be designed for four 36,000-kw. turbo-generators. Only one of these units, however, is to be included in the original installation.

Convicts Erect a Hydro-Electric Plant.—Under the supervision of the warden of the Canon City (Col.) penitentiary convicts there have just built a small hydro-electric plant. The location is about a city block from the prison, the water rights and the completed plant costing $23,000. It is planned to use the energy for running the machinery in the various prison factories and the claim is made that there will be a saving to the state.

Coming Meetings of N. E. L. A. Technical Committees.—Meetings of the Technical National Section, N. E. L. A., committees will be held at the Book Cadillac Hotel, Detroit, next month as follows: October 6 and 7, electrical apparatus, inductive co-ordination, meter, prime movers; October 8 and 9, accident prevention, hydraulic power, overhead systems, underground systems. On October 7 also the executive committee will meet and the general meeting and dinner of the section will take place.

Barstow Acquires a Winston-Salem Property.—The General Gas & Electric Corporation has purchased the property of the Winston-Salem (N. C.) Gas & Electric Company, and the latter company will be operated under the direction of the North Carolina Public Service Company, with headquarters in Greensboro, that company being a subsidiary of the General Gas & Electric Corporation, which is the holding company for the W. S. Barstow properties. Improvements in the service of the North Carolina company to cost about $100,000 are to be made.

Ice Plants Now Public Utilities in Oklahoma.—A permit to manufacture, sell and distribute ice at Hollis, Okla. was issued to the Southwestern Light & Power Company by the Corporation Commission, under authority of a law passed by the last Legislature making ice companies public utilities and placing them under control of the commission. In granting the permit the commission requires the Southwestern Light & Power Company to have at least a 15-ton distilled-water ice plant in operation at Hollis on or before April 1, 1926, or otherwise the permit will become null and void.

Clinton, Mo., Finds Municipal Service Inadequate.—The City Council of Clinton, Mo., has called a special city election to be held October 9 for the purpose of voting on an offer made by the Studebaker Corporation for the municipal light and power plant. The company, which has offered $190,000 cash for the plant and is asking for a ten-year franchise and a five-year lighting contract, has guaranteed that the present low rates will not be raised. The municipal plant was closed several months ago and is in need of repair. The city has since been purchasing energy from the West Missouri Power Company, of which the Studebaker interests recently obtained control.

Will Build New Spokane Plant.—Construction of a new hydro-electric plant on the Little Spokane River, about 35 miles northeast of Spokane, to develop 1,000 hp., will be undertaken by the Mount Spokane Power Company, Deer Park, Wash., early next year. The installation will cost approximately $45,000, to be financed principally through local stock sales, according to Mark F. Mendenhall, president.

Los Angeles Has Two-Word Electric Sign with 5,277 Lamps.—A new record for the number of lamps per letter on an electric sign has just been set in Los Angeles in a roof sign advertising "Pan gas," which has been installed on the roof of the Pan-American Petroleum Company's new building. In this double-faced advertisement of only twelve letters there are 5,277 lamps. The letters are 28 ft. in height and are supported on a structure 53 ft. high

and 168 ft. long. The stroke of each letter is made up of five rows of lamps, the center row being red, the two rows on either side of the center white and the outside rows green. Under the present operation the sign first appears red, then green, then white, and finally all colors together. Ten-watt sign lamps are used with color hoods for all but the white. Feeder capacity has been provided for the ultimate use of 25-watt lamps. The sign was installed at a cost of approximately $20,000 by the Electrical Products Corporation under the direction of Holmes & Sanborn, consulting engineers of Los Angeles.

The Terminable Permit Advocated for Illinois. — A "terminable permit commission," composed of members of both houses of the Illinois Legislature, has organized at Springfield and will study the public utility companies of the state with the view of fathering legislation in the direction indicated by the name of the commission. A subcommittee will report a detailed plan on November 2 at a meeting to be held in Chicago.

Nebraska Central-Station Men to Confer.—About fifty men engaged in the commercial departments of Nebraska central-station companies are expected to gather for a three days' conference at Grand Island, September 18, 19 and 20. Here they will camp in tents near the Central Power Company's new steam plant on the Platte River, about four miles from the city. Business talks will be varied by fishing, bathing, boating and golfing. President Davidson of the N. E. L. A. will open the meeting and officers of the Middle-West Division are expected to participate. Manager C. D. SeChevrell of the Central Power Company, chairman of both the state and division commercial sections, will be host.

Aberdeen, Wash., Gets More Time to Begin Wynooche Development. — The Washington State Supervisor of Hydraulics has granted the city of Aberdeen, Wash., an extension of time to September 1, 1926, in which to begin development work on the Wynooche water and power project, which has been the subject of much delay, controversy and litigation. (See ELECTRICAL WORLD for June 20, page 1364.) Preliminary work has already begun on the municipal waterworks, and it is again said that an election to vote bonds for the construction of a hydro-electric plant will be held in the near future. It will be remembered that bonds previously voted were declared void by the courts on the ground that they embraced two projects, a water system and a hydro-electric plant, under one issue.

Westinghouse Company Awards War Memorial Scholarships.—Awards have recently been made of the four war memorial scholarships offered annually by the Westinghouse Electric & Manufacturing Company as a memorial to those employees of the company and its subsidiaries who entered the service of their country during the World War. Each scholarship carries with it an annual payment of $500 for a period not to exceed four years, such payment to be applied toward an engineering education. This year's awards go to Bernard C. Hibler, who will attend Penn State College; Robert G. Redhead, Washington University, St. Louis; William H. Hamilton, University of Pennsylvania, and Starling Winters, University of California. Thirty-six candidates in ten cities competed.

Rural Service Experiments in Illinois.—A demonstration of the experimental use of electricity on ten farms in the vicinity of the University of Illinois, Urbana, Ill., has just been conducted in the presence of a group of electrical officials and farm experts, the University of Illinois, the Illinois Electric Association, the National Committee on the Relation of Electricity to Agriculture, the American Farm Federation and the United States Department of Agriculture co-operating. The 7-mile line built in Champaign County by the Central Illinois Public Service Company serves farms varying in size from 75 acres to 600 acres and represents a diversification including dairying, poultry raising, stock raising, general farming, grain farming and seed production.

Colorado Engineering Council Proffers Its Counsel to Denver.—Free advice and consultation have been offered to the city of Denver in its engineering problems by the Colorado Engineering Council, under the leadership of H. E. Sands, district engineer of the West-

inghouse Electric & Manufacturing Company. The object of the Engineering Council in making this offer is the exercise of public spirit by assisting in civic betterment. The council is composed of the Colorado Section of the American Institute of Electrical Engineers, the local bodies of civil, mechanical, chemical, metallurgical, steam and heating, mining and petroleum engineers, architects, the Teknick Club, the Pueblo Engineering Council and the Colorado Society of Engineers.

Rural Extension Work Still Being Pushed in Virginia.—Prof. James A. Waller, Jr., who is in charge of the farm electrification work in Virginia, including the 6-mile Fairfield power line in Chesterfield County which serves thirty subscribers, has just completed a survey of the lines of the Alexandria Light & Power Company and also of the rural lines owned by the Virginia-Western Power Company in the neighborhood of Staunton. Every rural power line in the state serving as many as four or five farmers is to be thoroughly covered by the survey. Two questionnaires are filled out—one by the farmer using power and one by the power company—and from these it is expected to get sufficient data to determine whether rural power lines are being operated profitably to the farmer and to the company and what extensions and improvements in service and use can be suggested.

Russia Wants Capital for Great Power Project.—Leon Trotzky, as head of the Scientific and Technical Bureau of the Supreme Economic Council in charge of electrical development, has, according to newspaper dispatches, expressed approval of a project for the construction of a hydro-electric power station of 300,000 hp. capacity on the River Dnieper in the southern Ukraine. Trotzky said that American capitalists will be invited to investigate the capabilities of the enterprise and that the government will be requested to assign $500,000 for the expenses of this investigation. The proposed power station would be in the midst of rich manganese and iron ore mines in the districts of Nikopol and Krivoy Rog, on the lower Dnieper. Trotzky, who has been investigating the project on the spot for the government, said it would be necessary to place orders for hydro-electric and other power equipment abroad.

Edison Association to Meet at Hot Springs, Ark.—Departing from its former practice of holding its annual meetings in Eastern summer resorts, the Association of Edison Illuminating Societies will convene next month, during the week of October 19, in Hot Springs, Ark., at the New Arlington Hotel. It is hoped in this way to attract a larger and more representative attendance from member companies in the South and on the Pacific Coast. In addition to the usual reports and papers dealing with matters of fundamental importance to member companies, the program this year will include communications on steam heating as an adjunct to the electric power business, alternating-current low-voltage networks, improvement of load factor and merchandising questions includnig the relation of lamp sales to central-station lamp policy. It is hoped that some matters of scientific interest and of novel character may be presented as a supplement to the formal technical program.

Industrial Lighting Campaign Opens on Pacific Coast.—The first gun of the N. E. L. A. industrial lighting committee's campaign in the Pacific Coast Division has been fired by A. M. Frost, sales manager San Joaquin Light & Power Corporation, Fresno, who is chairman of the geographic division. This initial attack is in the form of two letters, one addressed to central-station executives in California, Arizona and Nevada and the other addressed to manufacturers of industrial lighting fixtures and their jobbers. In these communications Mr. Frost points out the opportunity that will be presented through national advertising and through contact with industrial executives, by means of central-station salesmen, jobber salesmen, electrical leagues and contractor-dealers, to develop an appreciation of the great value of proper industrial lighting, which can be capitalized immediately through the sale of better equipment, resulting in an immediate increase in kilowatt-hour sales. Mr. Frost hopes to have an early meeting for organization and appointment of section leaders.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 14-17. O. A. Weller, 900 15th St., Denver.

Illuminating Engineering Society—Hotel Statler, Detroit, Sept. 14-18. N. D. Macdonald, 29 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Benjamin Franklin Hotel, Philadelphia, Sept. 14-19. John F. Kelly, Empire Bldg., Pittsburgh.

American Institute of Electrical Engineers, Pacific Coast Section—Olympic Hotel, Seattle, Sept. 15-18. F. L. Hutchinson, 33 West 39th St., New York.

Great Lakes Geographic Division, N. E. L. A.—French Lick Springs, Ind., Sept. 23-26. R. V. Prather, 305 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden, Ind., Sept. 23-25. L. W. Davis, 15 West 37th St., New York.

American Electrochemical Society—Chattanooga, Tenn., Sept. 24-26. Colin G. Fink, Columbia University, New York.

Pacific Coast Supply Jobbers—Hotel Del Monte, Del Monte, Cal., Sept. 24-26. A. H. Elliot.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 1-2. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 5-9. J. W. Welsh, 292 Madison Ave., New York.

National Association of Railroad and Utilities Commissioners—Washington, D. C., Oct. 13-16. J. B. Walker, 270 Madison Ave., New York.

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Edison Illuminating Companies—New Arlington Hotel, Hot Springs, Ark., Oct. 19-23. Preston S. Millar, 80th St. and East End Ave., New York.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andreucetti, 413 C. & N. W. Terminal Station, Chicago.

American Welding Society—Boston, Oct. 21-23. M. M. Kelly, 29 West 39th St., New York.

Kansas Public Service Association—Topeka, Oct. 23-24. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Southeastern Geographic Division, N. E. L. A.—Chattanooga, Tenn., Oct. 29-30. E. T. O'Connell, Alabama Power Co., Birmingham.

Associated Manufacturers of Electrical Supplies—New York, Nov. 9-13. F. Nicholas, 30 East 42d St., New York.

Kentucky Utilities Company Buys Mining Power Plant.—Harry Reid, president of the Kentucky Utilities Company, has announced purchase of the power plant owned by the W. G. Duncan Coal Company at Greenville, Ky. This is a 6,000-kw. modern plant built by the coal company during the war period and under lease for the past two or three years to the utility company. The plant has been purchased at a price of $1,000,000, including sufficient coal acreage to supply fuel for fifty years and two artificial lakes which provide water supply. There is 12 miles of 33,000-volt transmission line tied in with other lines covering the western section of the state and interconnected at Morganfield with the lines of the Central Illinois Public Service Company. Further construction will connect the eastern and western Kentucky lines of the company and the Dix River hydro-electric plant, near Danville.

Half Indiana's Potential Water Power Harnessed.—Data relative to the potential water power from Indiana streams and conservation of the fuel supply of the state have been compiled by the Indiana conservation department. The department estimates that less than one-half of the available water power, without storage, has been harnessed by industry, there being a minimum of 118,000 hp. on streams and 56,076 hp. being now developed from that source. Utilization of 50,000 hp. more hydro-electricity would, the department says, mean a saving of 500,000 tons of coal a year. Twenty-five projects in Indiana are developing 100 hp. or more by water at present. Most of these are in the northern part of the state on the St. Joseph, Elkhart and Tippecanoe Rivers in the vicinity of Elkhart, South Bend and Monticello. Five projects are operated by White Water River at Connersville. The largest plant is that of the Indiana & Michigan Electric Company, near Mishawaka, which is rated at 12,750 hp. The next largest is operated by the Interstate Public Service Company with a rated capacity of 9,820 hp. on the Tippecanoe River near Monticello. The Interstate, with twelve hydro plants, rated at 31,667 hp. in all, is the largest individual user of water power.

Men of the Industry

Burrows and Frech to Manage General Electric Lamp Business

Gerard Swope, president of the General Electric Company, has announced the appointment of **T. W. Frech** of Cleveland and **W. R. Burrows** of Harrison, N. J., as associate managers of the incandescent-lamp business of the company. They will relieve George F. Morrison, F. S. Terry and B. G. Tremaine of the burdensome part of the responsibilities which have devolved upon them as managers of this business for many years. Mr. Morrison, whose physicians have advised him to lessen his business responsibilities, is a vice-president and director of the company; Mr. Terry is a vice-president and Mr. Tremaine is a director. They will continue to be connected with the company in these capacities.

G. C. **Osborne** has been appointed sales manager of the Edison lamp division, a position formerly held by A. D. Page. Mr. Page will continue as a member of the advisory lamp committee, which now consists of Messrs. Swope, Morrison, Terry, Tremaine and Page.

J. C. Kennedy Heads Southwestern Gas & Electric Company

Announcement is made that **James C. Kennedy** of Marshall, Tex., president of the East Texas Public Service Company, has been named president of the Southwestern Gas & Electric Company, recently acquired by the Middle West Utilities Company. **A. G. Curtis** continues as vice-president and **H. L. Nickerson** has been promoted from the office of auditor to that of treasurer. Mr. Kennedy, who succeeds Rufus C. Dawes as president, is well known for his noteworthy accomplishments in east Texas since 1922. **Knox Lee** of Marshall, Tex., has been made general manager of the East Texas Public Service Company, according to an announcement made by Mr. Kennedy. Mr. Lee will direct all operating and construction matters concerning the East Texas group which previously have been cared for by Mr. Kennedy.

A. F. Moriarty, until recently assistant to V. L. Board, general superintendent of the Public Service Company of Colorado at Denver, has resigned to become commercial manager of the Central Arizona Light & Power Company at Phoenix. A successor to Mr. Moriarty has not yet been chosen.

Frederick E. Hazard has been appointed manager of sales promotion and advertising for the Servel Corporation, New York City. Mr. Hazard entered the electrical industry in 1912 as New York and New England distributor for the Brokaw-Eden Company. He was secretary and assistant sales manager of the company when he resigned in 1919 to become the organizer and president of the Blue Bird Appliance Company. In 1922 he was made vice-president in charge of sales of the Conlon Corporation, and later in 1923 he joined the Eden Washer Company as sales manager. Meanwhile, however, Mr. Hazard was strongly attracted by the opportunity offered in the field of domestic refrigeration, and he associated himself with H. G. Seaber and J. H. Dennedy in the development of the Servel machine. He has now left the washing-machine industry, with which he has so long been prominently identified, to join the Servel Corporation.

E. W. Lloyd New Chairman of Commercial Section

E. W. Lloyd, who has been appointed chairman of the Commercial Section of the National Electric Light Association, has served as general contract agent for the Commonwealth Edison Company for nineteen years and during this period has been prominently identified with commercial work in the central-station field. Though a native of Belleville, Ontario, Mr. Lloyd came to the United States at an early age and received his first training at Erie, Pa. After working for two years as draftsman at the steel mills in Pittsburgh, he became identified with the Crane Company in Chicago in a similar capacity. It was in 1893 that he entered the employ of the Chicago Edison Company, predecessor of the Commonwealth Edison Company, serving successively in the drafting department, on engineering tests, in the construction department and in the sales department. In 1901 Mr. Lloyd was made assistant superintendent of construction and in 1906 was promoted to the position of general contract agent.

E. W. LLOYD

Mr. Lloyd has been deeply interested in the Commercial Section of the National Electric Light Association since its inception. He has contributed many valuable papers and reports at the sessions of this section and served as its chairman in 1912-1913. Mr. Lloyd was in addition president of the association in 1915-1916. He is an associate member of the American Institute of Electrical Engineers and a member of the Association of Edison Illuminating Companies, the Illuminating Engineering Society, the Electric Club of Chicago and other organizations.

Dr. Kurt Konstantinowsky, lecturer in physics at the University of Vienna, Austria, and **Hugo Sonnenfeld**, chief engineer and general superintendent of the Cable Manufacturing Company, Ltd., Bratislava, Czechoslovakia, are at present on an inspection tour in the United States with the purpose of studying American cable practices. They will visit various electrical manufacturers and utilities before returning to Europe at the end of October.

Jacob I. Beals, division superintendent of the Monongahela West Penn Public Service Company, Clarksburg, W. Va., has resigned. Mr. Beals' period of service with the organization covered about eight years.

A. P. Gale, formerly district manager of the Wisconsin Power & Light Company at Tomah, Wis., has been appointed director of public relations of that company, succeeding T. F. Keefe, who, as previously announced in the ELECTRICAL WORLD, now has charge of the Beloit Water, Gas & Electric Company.

Obituary

William Ellsworth Dunn, one of the pioneers in the electrical development of southern California, died after a short illness August 22, at the age of sixty-four. Born in Michigan, Mr. Dunn went to southern California about thirty-five years ago and became associated with Henry E. Huntington in the development of the electrical industry there. At the time of his death he was vice-president of the Los Angeles Railway Company and a member of the legal firm of Gibson, Dunn & Crutcher. He was a director of the Southern California Edison Company, First National Bank of Los Angeles, the Rodeo Land & Water Company and was interested in a large number of other enterprises.

Edward R. Stettinius, noted financier and member of the banking firm of J. P. Morgan & Company, died at his home in Locust Valley, Long Island, N. Y., September 3, in his sixtieth year. Mr. Stettinius, who had been ill for two years, was born in St. Louis in 1865 and was educated at the St. Louis University. In 1906 when the Stirling Consolidated Boiler Company, which he had organized, was consolidated with the Babcock & Wilcox Company, he was made vice-president of the new company. His connection with the Morgan house began in 1915. When, at the beginning of the following year, he was made a partner in the firm, he was also officially connected with the American Gas & Electric Company, the American Power & Light Company and the Babcock & Wilcox Company. At the time of his death Mr. Stettinius was a director and member of the executive committee of the General Electric Company and the International General Electric Company and a director in the Babcock & Wilcox Company.

Recent Court Decisions

What Weight Should Be Given to Engineers' Estimates? — In passing upon an appeal by the Boise Artesian Water Company from the valuation put upon its property by the Idaho Public Utilities Commission, the Supreme Court of Idaho dealt with engineers' estimates and the relative weight attaching to them as follows: "In our judgment an estimate by an engineer as to the cost or value of the property of a utility, or as to any of the component parts going to make up the total cost or value, is not necessarily conclusive. No more weight should be given such an estimate than is justified by the evidence sustaining the items included in the estimate. While in this case there is no controversy relating to the numerical inventory of the physical property, with respect to the cost and value of many of the items involved, etc., there is a substantial conflict in the evidence. In saying, therefore, that the commission should not have wholly disregarded the estimates of engineers in fixing the value of the property of this utility, we do not desire to be understood as holding that the commission is required to do more than give such fair consideration and due weight to such estimates as to all other evidence relating to the value of the property." (236 Pac. 525.)*

Commissions Not to Be Limited to One Rule or Theory of Valuation.—The Boise Artesian Water Company, complaining among other things that the Idaho Public Utilities Commission in fixing a valuation for rate-making purposes did not value the property as of the date of the inquiry and failed to recognize or even give fair consideration to the cost of reproduction, appealed to the Supreme Court of the state, which set aside the order of the commission on various grounds. In part the court decision said: "While the question of the valuation of the property of utilities has been the subject of extended study by courts, commissions and writers, no one rule or theory has been uniformly adopted as the correct rule, to the exclusion of all others, to fit all cases and changing conditions. Since the object to be attained in all valuation proceedings is the fair value of the property of the utility, used and useful in the service to which it is devoted, it would appear to be a mistake to limit a commission, in ascertaining and determining the ultimate fact, to any one rule or theory. It would be much better, in view of the practical problems facing the commission in every valuation proceeding, to require it to give fair consideration to all evidence relating to value, to the end that the final judgment of the commission may be arrived at from a consideration of all the evidence available. We therefore lay it down as our view that, in valuing the property of a utility, the commission should require evidence relating to the cost of reproduction or replacement, actual cost, depreciation, earning capacity, present service condition, investment, the service furnished, and any and all other relevant evidence, so that its final judgment will be based on evidence bearing on cost and value in all their phases and relations and the value found to exist will be determined from a careful consideration of all relevant facts, conditions and circumstances. We do not understand that this view can be said to be out of harmony with the logical conclusion to be drawn from the decisions of the Supreme Court of the United States on the question of utility valuation. . . . While it cannot be contended that the utility owner may rightfully demand that any one rule or principle for determining the value of his property shall be adopted, he is entitled to have evidence of reproduction cost considered and given such weight as may be just and proper in view of all the other facts and circumstances. 'So, even if we tried to use the reproduction new cost less depreciation as a measure of value, we are without the depreciation measure,' said the commission in the order from which the appeal is taken. Finding the then present fair value of the property of the utility was the object of the hearing. The commission had power to require the production of the necessary evidence. It could have been required of the company or of its own engineering force. As has been stated by it heretofore, . . . the work of the commission is primarily practical, and the commission should have required the production and submission of all necessary evidence to enable it better to reach a proper determination of the question which was before it." (236 Pac. 525.)

Unused Investment Prudently Made Is Defended.—A special master's report fixing the value of telephone property and determining gross and net income was confirmed by the United States District Court for the Eastern District of South Carolina in Southern Bell Telephone & Telegraph Company vs. Railroad Commission, and rates prescribed by the South Carolina Legislature were declared to be unreasonable and confiscatory. Concerning "unused investment" the court said: "From the evidence it appears that in establishing its plant in various towns and cities the plaintiff planned for the future growth of such towns and cities and laid down therein equipment sufficient to provide for such growth. The defendants claim that the value of the additional equipment so provided for future use should not be included in the present value on which remuneration should be allowed, on the ground that it is idle capital. But such equipment is not idle capital in the proper sense of the term. A business concern, and especially a telephone company, must look to the future as well as the present. It is the part of wisdom to forecast the growth of communities they serve and be prepared to meet new conditions as they arise." (5 Fed. (2d) 77.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Approval by Commission of New Securities Must Be Based on Specific Application.—The Public Utilities Commission of Maine declined to authorize an issue of securities to cover future extensions by the New Sweden Light & Power Company because no evidence was presented to it concerning the nature or size of such extensions and no estimate of cost submitted. These, the commission held, should have been included in the application, and it therefore left for future consideration on a new petition the authorization of a security issue "either for future extensions or improvements on proper showing or for extensions or improvements that shall then have been made."

Consolidation a Matter for Company Decision Where Public Rights Are Not Involved.—In granting a petition of the Bangor Railway & Electric Company involving consolidation, the Maine Public Service Commission said: "In the absence of an invasion of the rights of the public, this question, in the first instance primarily a matter of policy, is to be determined by the utilities themselves, which, from motives of self-interest, may be assumed to balance the probabilities before consummating their plans. Regulatory commissions are properly not the managers of public utilities, and in the absence of practices and conduct which impinge upon the rights of the public, such matters should not be interfered with by such commissions. The property of public utilities is held in private ownership."

Stock Issue to Build Competing Line Disapproved.—Holding that the building of a competing transmission line in territory occupied by another company would be of doubtful benefit to the applying corporation and might result injuriously to the purchasers of stock issued for that purpose, the New Jersey Board of Public Utility Commissioners disapproved an application of the Community Power & Light Company for authority to issue the securities alluded to. "It is the duty of this board," the commission said, "to pass not only upon the legality of a financial proposition advanced but upon the merits of the subject matter itself from the standpoint of a wise public policy having for its object the safeguarding of the public against ill-considered and reckless financial ventures, the securities of which might entail loss on the public investing therein. It appears that if the proposed line is built, the petitioner must seek its customers largely in the same territory that is now being supplied by the New Jersey Power & Light Company. Experience has shown that competition among utilities is not for the best interests of the public. It is usually short-lived and results either in the failure of both utilities or in their merger," the commission observed. "If a lower price results, it is merely temporary."

Manufacturing and Markets

Secrecy Cause of Delay

Retardation of Industrial Electric Heating Development Ascribed to Undue Reticence

ONE of the most interesting developments at present under way in electrical applications is industrial heating. This is coming to the front so rapidly that central-station companies are seeking to add specialist sales engineers to their staffs competent to build and hold this class of loads in miscellaneous industries. It is safe to say that the American manufacturers are thoroughly convinced of the value of motor drives as a class, even to the desirability of using more and more individual motor applications; but in the heating fields there is still not a little misinformation and scepticism about the place of electricity. This situation means that every central-station power engineer is being put on his mettle to obtain as complete data as possible about the operation and costs of such electric heating apparatus as he can learn about, and the more such data become disseminated, the faster progress is made.

Great improvement has been achieved of late in instrumentation adaptable to heating cycles, and the stage is really set for something worth while if the central-station engineer can gradually overcome the conservatism of his customers in regard to releasing detailed information about such applications for the general good of the industries concerned. The central-station engineer has and deserves the confidence of his customers, and much the same can be said of the manufacturer of heating devices, especially of devices designed and built to solve peculiar and advanced problems in processing. It is to the credit of electric heating device manufacturers and central-station engineers that they are observing the strictest honor in keeping the confidence of their customers; but it is the duty of the electrical man to cultivate an open-minded attitude on the part of many industrial customers in regard to making available such data for general use. More and more industrial establishments are doing this, but the process can be speeded up by sustained diplomacy on the part of the electrical fraternity.

Information Speeds Progress

It is becoming more and more futile for manufacturers to try to keep trade secrets secret. Alertness to discover and supply the needs and opportunities of a market counts for more than vested rights in processes by and large. It is true that in certain processing many concerns maintain a stock in trade, and at the present stage of electric heating applications it is not so much the desire of the manufacturer and the utility man to have these details broadcast as to obtain permission to show others the electrical equipment in use and to publish fundamental information which will guide other heating apparatus makers and users in many lines toward more accurate determination of designs and operating cycles.

Cases have recently come to hand where the heating apparatus user was willing to show his apparatus to visitors but refused to sanction giving out the kilowatt demand or energy consumption of the equipment, and even the detailed construction of the heating equipment has sometimes been hidden from the profane eye. Another concern was of the opinion that it held a monopoly of the industry knowledge of heating applications, but became somewhat more liberal as to viewpoint when the electric furnace manufacturer pointed out that competitors had also made confidential developments in advance of the first company's. In sum, the art is advancing along many lines, and in the interest of all users and manufacturers the more information that is made generally available, the more rapid will be progress. In the long run this means that lower costs of installation and operation will be attained, thereby further hastening the days of mass production with reduced unit prices of electric heating material and energy to operate such equipment.

Fixture Market Requires Stabilization

Profits Impaired by Cut-Throat Competition—Relations with Architects Should Be Strengthened—Simplification of Stocks and Grading of Prices

By a Fixture Jobber

GRANTING that this year has been one of unprecedented growth in building, in my opinion the electric fixture business is far from satisfactory. In view of the great volume of new construction now going on, not only my firm but virtually every other reliable jobber will concede that his proportion of the total volume of new business in electric fixtures which has been coming in and is likely to come in under the present conditions is far too small. It is an unfortunate fact that reputable jobbers all along the line from the small firm to the largest house are not getting a reasonable slice of the fixture business. Other jobbers tell me the same story of little or no profits—it is costing too much to sell.

Of the many handicaps which we have to meet in the business today, the first is the relation between the fixture manufacturer or jobber and the architect. In general, fixtures for lighting occupy an unfortunate location in the development of plans, often being the last specified item, and frequently not specified at all. Accordingly, our product is not given the attention that it deserves, but worse yet, we get the "tail end" of the budget, which means, under the present high cost of construction, a very small appropriation for fixtures. Consequently, fixture dealers are continually paring down estimates and revising schedules, and rarely are sales made today without first meeting radical changes and revisions in prices, which, of course, are always downward.

Service to Architect Essential

Relations with architects are a matter of extreme importance. As a class these men are not specialists in electric illumination, but manufacturers and jobbers of fixtures should be experts on the subject, and on the latter rests the responsibility of emphasizing fixtures and their installation in all construction projects. The status of fixtures should parallel that of plumbing equipment and installation. At the present time it does not, but the right kind of service to architects will bring this about. To this end service in electric illumination should be an important phase of the work of dealers in lighting fixtures. This is the first step in the move to reduce the cost of selling.

Competition, not only in selling fixtures, but in installing them, has reached the stage where it appears that the oldest law, "the survival of the fittest," reigns supreme. Such competition generally is not that which usually exists between reputable firms; it has become a kind of piracy, and has almost broken the backbone of the fixture business.

Types of Competition

A few examples will show how it works out. During the recent industrial depression in New England mill and factory electricians and wiremen, all of whom could easily obtain master wiring licenses, entered the inviting field of contracting, and with no capital, no overhead except the rent of a vacant cellar, became electrical contractors overnight. In addition, the extraordinary building boom invited many others with no greater responsibility, until today almost literally, "the woods are full of them."

Day labor at attractive prices is the goal of the basket contractor, and not profit on supplies and equipment. Many cases can be cited where this class of contractors furnished the fixtures at cost, and in most cases at very little margin, the profit being derived from labor only. The lowest bidder on a

large wiring contract for a hospital submitted a figure admittedly below the cost of supplies and installation presented by well-known firms. Profit on labor, profit on "extras" and rock-bottom prices for fixtures—this is their slogan.

Prices of fixtures have been slashed by many jobbers in an effort to stem the tide. Stock reductions, clearance sales and periodic unloading have been the rule, but these efforts have not yet checked the cut-throat methods which are in vogue among those who have no overhead charges, who enjoy low rentals with no soliciting charges or service, and who sell at a low price on a cash and discount basis.

STOCKS ARE TOO VARIED

Many jobbing houses have long suffered under the handicap of large stocks. They place much of the blame for this condition on manufacturers, and some on what appear to have been ill-advised recommendations of national illuminating organizations. The trade is glutted with quantities of designs, shapes, styles and effects that appear to be ever-changing. Previous to the World War, when many dwellings of the "custom-made" kind were built, the taste for variations, for high quality and for pleasing effects in a large measure absorbed the stocks on hand. But today much of the new construction is of a speculative nature, and in this kind of venture the "wire-man" contractor and his methods get a footing. Over-the-counter sales rule, and orders are in small lots and at reduced prices. The cost of selling a high-class product has gone far toward driving the conservative house from the field.

Only one solution to this problem appears — a more careful gradation in stock and prices. Labor costs are high and little reduction may be expected from this quarter. On the other hand, both manufacturers and jobbers must work toward the common end of a reduction and standardization in the number of designs with carefully graded prices on the basis of current budgets for various types of building. Some concerted movement to this end seems vitally necessary on the part of both reputable jobbers and manufacturers. Otherwise reasonable profits and future promise of business success will be long deferred indeed.

Simplified Practice Program of Department of Commerce

Suggestions are coming to the Department of Commerce that it should do more than initiate simplified practice programs. In the elimination of excess variety, for instance, some industries are finding that a follow-up campaign is desirable. They think agents of the Department of Commerce can do the follow-up work better than can any one else. There is no thought of coercion; the sole purpose is to do educational work. In some instances it is necessary to convince the manufacturer that adherence to standardization is in his interest.

There has been some misunderstanding as to the extent to which simplification is to be carried. It is to apply to stock sizes only. There never has been any intention of discouraging any one from producing an odd size or special variety on order. There is no thought of bringing a manufacturer to an agreement which would put him in a position where he could not fill any unusual order if he so desired. The disposition of the department apparently is to leave the educational work to the industry concerned, but seemingly some of the manufacturers most interested in seeing simplification succeed feel that a federal bureau is in a better position to direct a nation-wide field service than is any agency of the manufacturers themselves.

Tungsten Producers Move for Higher Tariff

Application has been made to the United States Tariff Commission on behalf of owners of domestic tungsten properties for the 50 per cent increase in the duty which the President could grant under the flexible provisions of the act. The probabilities are that the commission will simply report the essential facts surrounding this metal to the President, leaving it to him to draw his own conclusions. Knowing the President's friendly feeling for high tariff schedules, the domestic producers are confident that he will allow the full 50 per cent increase.

The present duty on tungsten is equivalent to $7.14 a unit. The domestic producers contend that this will not allow them to operate. They will be able to point out that two domestic producers during the past year have made actual efforts to operate but were forced to close their mines. The average price of tungsten at that time was around $10. If the increased duty were granted, it probably would insure a price of $15 under present conditions.

War-time stocks now have been depleted to the point where tungsten again is being imported in quantity. The June imports were at a rate equal to one-half of the requirements, which now are estimated to be running at about 5,000 tons per annum. The domestic producers feel that this is an opportune time to obtain an increase in duty. So long as large stocks were in existence they could have been prevented from enjoying the full benefit of the higher duty. It is true that one domestic property is operating under the present duty, but this is declared to be possible because of a favorable lease which does not allow any amortization of the large capital expenditures in equipping and developing the property.

Business Conditions

THROUGHOUT the country the volume of business transacted indicates that sales are holding up very well, with the trend upward in most sections. Central-station companies and various industries are purchasing steadily, and it is the belief of electrical men that the volume of sales will at least be maintained for the rest of the year. Several large orders were reported as being placed during the week. Central-station companies in the East purchased well over $1,000,000 worth of circuit breakers, voltage regulators, transformers, etc. A utility company also ordered 3,500,000 lb. of copper wire, creating a slight flurry in the copper market. Line extensions in the Southeast have also resulted in the placing of a large pole order, which will shortly be followed by orders for line construction materials. Sales of radio equipment and supplies have shown considerable improvement, and manufacturers and dealers are looking forward to a prosperous season. The volume of car loadings for the week of August 29 is reported as setting a new high record, indicating a high industrial and agricultural activity.

In New England sales of voltage regulators have been outstanding in the steady flow of sales of electrical equipment and supplies. Electric refrigeration is active and street lighting and industrial heating continue to gain ground in that section. Large sales of transformers, circuit breakers and other equipment totaling more than a million dollars were made in the New York district, and orders from one utility company covered about 3,500,000 lb. of copper wire. In the Southeast sales are spotty but on the upward trend. The drought in that territory continues, and it has been found necessary for water-power companies to curtail service. Building construction continues active in the Middle West and contractors are busy. Fan business is unusually good in that section, with the result that the usual August reductions will doubtless be postponed if made at all. On the Pacific Coast business is good and has been marked not only by large single orders but by good average sales.

Large Sales of Non-Ferrous Metals—Zinc Strong

A SURPRISINGLY large volume of business in each of the major non-ferrous metals has been placed. Most of the activity was on Thursday and Friday of last week. Considerably more copper was sold than during either of the three weeks immediately preceding, 14.75 cents being the prevailing figure. Some copper was sold at 14.875 cents delivered in the West on Thursday and Friday of last week, and an excellent tonnage brought 14.75 cents in the Connecticut Valley. Business has been actually done at 14.625 cents and 14.70 cents delivered, at which figures metal can be obtained in several directions. Most sales agencies continue to be content not to force metal on the market, though inquiry is fair and good sales could be made if prices were shaded.

Cables from London on Tuesday and Wednesday showed sharp declines so

that buyers were disinclined to meet the asking prices of most producers. Domestic producers are transacting no business abroad, quotations being strictly nominal.

The American Smelting & Refining Company maintained its official contract price for New York lead at 9.50 cents all week. The leading interest in the West, on the other hand, is quoting 9.25 cents in the St. Louis market, thereby putting the two major lead markets in approximately their normal relation. Increased demand on the part of galvanizers has added strength to the zinc market, a consistent increase in quotations having been recorded each day during the week. Though domestic business in tin has been comparatively small, the price for prompt Straits strengthened during the week, closing at 57.375 cents.

NEW YORK METAL MARKET PRICES

	Sept. 2, 1925 Cents per Pound	Sept. 9, 1925 Cents per Pound
Copper, electrolytic	14.625¾	14.625-14.70
Lead, Am. S. & R. price	9.50	9.50
Antimony	16¾-17¼	17-17¼
Nickel, ingot	33-34	33-34
Zinc, spot	7.925	8.075
Tin, Straits	56.625	57.375
Aluminum, 99 per cent	28	28

Base copper price Sept. 9, 1925, 16¼ cents

Increased Export Demand for Friction Tape

RECENT improvement in the foreign exchange situation has led to a marked increase in overseas sales of friction tape, and some excellent business is being handled by prominent manufacturers for English use. Good sales are also reported to South Africa, Norway and South America. Canadian business lags on account of a "Buy products made in Canada" movement. In this country sales are running well ahead of 1924 figures, with the exception perhaps of one house. Roughly speaking, a gain of about 20 per cent in domestic sales is reported, noteworthy sources of business being the Florida building boom, interior wiring in other sections and the radio industry with its large experimental appeal. High praise is given in American sales circles to the co-operation of the consular representatives of the United States and to the Department of Commerce in supplying trade information to tape manufacturers, especially in enlarging foreign markets.

The principal fly in the tapemaker's ointment at present is the tendency of some long-established buyers to purchase on a price basis without due regard to quality. It is stated that price cutting by relatively inexperienced manufacturers has disturbed the market for several years. Some of these have gone to the wall on account of insufficient margins between cost and selling quotations, but others are in the field and, in the words of leading sales managers, are obscuring the real values in this commodity. One manufacturer pointed out that price per pound is not the final criterion, especially as the yardage per pound varies more or less with the quality. There is need of research into the composition and processing of tape which will insure satisfactory comparative life performance predictable to a greater degree than at present. Some of the established manufacturers increased their prices about 7½ per cent to 10 per cent July 1 as a result of the spectacular advance in the cost of rubber from around 22 cents per pound to about $1.25 within the past year. Late rubber quotations are about 85 cents; labor and sheeting costs are not far from last year's level, and deliveries are readily made out of factory stocks. Competition is sharp, but in some manufacturing quarters it is believed that users are gradually turning away from inferior products and recognizing the importance of more discrimination in buying.

Radio Supplies in Increasingly Strong Demand

SO STRONG is the demand for certain radio equipment at this time, reports a prominent jobber in New England, that one would not dare to predict the volume of sales for the ensuing season. "Suffice it to say, it will be tremendous," says this jobber. "At the present time the demand for loud speakers, battery chargers and batteries is increasing rapidly. It is an outstanding feature in our weekly turnover of electrical supplies. Dealers will do well to prepare to meet an unprecedented call by stocking up on standard equipment and supplies."

Delinquent Electrical Accounts for July Show Decrease

THE number of delinquent electrical accounts for July shows a decrease for virtually all sections, as compared with the previous month or with the corresponding month last year, according to the report issued by the National Electrical Credit Association. As compared with the same month last year, the total amount was the same or less for the Central, New York and Philadelphia divisions, but much greater for the New England and Pacific Coast sections, although in these latter sections the number of accounts showed a fair decrease.

The average amount compared with the same period was less in the Central and New York divisions, greater in the Philadelphia division and much greater in New England and the Pacific Coast.

As compared with the previous month, the total amount was less or the same, except on the Pacific Coast, where it was much larger. The average amount was almost the same in the Philadelphia and New England districts, about 9 per cent less in the New York district, 10 per cent more in the Central division and more than double on the Pacific Coast.

DELINQUENT ACCOUNTS IN JULY

Branch and Month	Number of Accounts Reported	Total Amount	Average Amount
Central Division:			
June, 1924	889	$108,723.48	$122.30
June, 1925	900	102,366.77	113.74
July, 1924	885	107,773.30	285.79
July, 1925	813	101,874.45	125.30
Philadelphia:			
June, 1924	248	28,063.46	113.16
June, 1925	259	36,497.91	140.92
July, 1924	270	30,596.62	113.32
July, 1925	216	30,594.59	141.64
New York:			
June, 1924	336	49,433.00	147.00
June, 1925	415	53,414.00	129.00
July, 1924	356	60,164.00	170.00
July, 1925	356	42,504.00	120.00
New England:			
June, 1924	88	7,021.00	79.78
June, 1925	87	15,310.35	175.74
July, 1924	112	10,683.63	95.40
July, 1925	87	15,310.35	175.74
Pacific Coast:			
June, 1924	22	3,877.39	176.25
June, 1925	17	2,193.62	129.04
July, 1924	19	616.00	32.42
July, 1925	18	5,063.21	281.28

Large Orders Placed in New York District—Sales in Fair Volume

TWO large orders placed in the New York district by central-station companies this week called for nearly $1,000,000 worth of transformers, circuit breakers, etc. A utility company also purchased 3,500,000 lb. of copper wire, causing a slight flurry in the copper market. Other good business is also in sight. Many other wire orders were also received from other sources. Central-station companies are also steadily buying distribution transformers and other supplies, with emphasis being placed by purchasing agents on the delivery dates. Prospects for continued purchases of such secondary equipment are believed good.

Orders from industrial firms have not been so heavy as last month, but manufacturers believe that prospective sales that should be made later in the month will result in a good volume of business during September. Switching equipment and insulators are in fair demand, with sales spotty. Sales in the last few days have consisted of regular moderate-sized and small orders with competition keen. Jobbers state that sales of supplies have improved very slightly, with a good movement of lamps and a marked increase in the demand for radio apparatus.

Sales Spotty in Southeast with Upward Trend

A SLIGHT improvement in spots and decreased business in other sections sums up the conditions in the Southeast. Florida continues very active, orders being received in large quantities for all types of building materials and wiring supplies, and "whiteway" equipment orders and prospects are both reported excellent. A national construction engineering firm reports the receipt in the past few weeks of contracts for building two hotels in one Florida town, one contract amounting to $3,000,000 and the other to $600,000. Merchandise lines are not keeping pace with construction lines, though there is some improvement to be noted. The great percentage of orders from Alabama and middle Georgia are coming from central-station companies.

The general outlook for fall business in the New Orleans territory is excellent, with prospects probably better than for several years past on account of the heavy building program under way. North Georgia offers little hope of business expansion this fall as the section is hard hit by the long-continued drought. Several central-station companies are engaged in further expansion of territories, and one order for

$50,000 worth of poles was received from a Georgia power company. This is a forerunner of orders for other line-construction materials and 2,300-volt equipment as the poles will be used in constructing new lines to a number of outlying properties which have not heretofore been developed. A brisk demand for complete radio sets and accessories is reported. The outlook for radio in the larger cities of the state and in the moderate sized towns of south Georgia is very bright for the fall. Lamp sales are holding up unusually well, showing an increase of 16 per cent in August over July. There is no break in the long-continued drought in the Southern territory, and water-power companies have found it necessary to make curtailments in service to commercial establishments and also further curtailments to industrial plants on their lines.

Business Good on Pacific Coast—Some Large Orders Placed

BUSINESS in all electrical branches is very good on the Pacific Coast, being marked not only by large, single orders but also by good average sales. Railroad purchasing is heavy and includes 60,000 lb. galvanized-iron wire and 50,000 lb. of tie wires, besides stock orders aggregating several hundred flashlights and renewals and miscellaneous shop material. Lamp sales are excellent for this season of the year, and appliance business continues very good, the bulk of the sales being in comparatively large lots and for immediate disposal. General business conditions, such as employment and collections, are very good.

Power company purchasing has included an order for $7,000 covering 55-ft. poles and a carload of fiber conduit, together with many pole-line hardware orders and much miscellaneous roughing-in material. An export order for 10,000 ft. rubber-covered wire is reported. Other interesting orders are one for $2,000 for a fire-alarm system for an Oakland hospital, 750 lighting units for a Los Angeles department store and an Oakland hotel lighting job also totaling about $6,000. General wiring business is very good, and lumber manufacturing plants are buying heavily.

Building Active in Middle West—Contractors Busy

BUILDING construction in the Middle West continues to be in excess of that for the same period last year. Some electrical contractors report the best summer's business they have had in several seasons. Good wire sales are reported by manufacturers, and delivery promises of four to ten weeks are now being made on the higher-voltage and special cables. Stocks of code wire are ample, and immediate delivery is being made of this material. Rains during the week end broke a long dry spell of approximately twenty-three days and, coming at this time, have saved the crops. It is anticipated that the volume of agricultural products will be the best in years and should result in great prosperity for the Middle West. Manufacturers are apparently waiting to see if the coming of fall will bring the usual increase in sales, when it is believed that some increase in price will be made on most commodities. Present prices have shown no change. Electrical retailers are putting on large sales with many attractive leaders, sometimes priced only slightly above cost in order to stimulate buying. With the thermometer reaching 90 deg. almost every day, fan business is unusually good for this time of the year. In contrast with last year the stocks of unsold fans should be very small, and the usual August reductions will doubtless be postponed if they are made at all.

Voltage Regulator Sales a Feature of New England Market

OUTSTANDING in the steady flow of sales which characterizes the trend in electrical supplies and equipment throughout New England is the increasing demand for voltage regulators. One prominent manufacturer reports several large orders for these, totaling over $50,000 during the past few days, and a similar trend is also reported for the previous week. Central-station supplies and building equipment and supplies are quite active. Conduit, pipe, wire, hardware and insulation are in good demand. Educational institutions are actively interested in electrical fixtures, and reflectors, shades and lamps are moving in good volume. Small-motor sales are spotty. One manufacturer records an even trend at the present time, with sales about 15 per cent to date above those for a similar period last year. Another manufacturer, on the other hand, reports a marked increase in the demand and increasing difficulty in filling orders promptly. Dealers in used motors and generators report a similar activity. One records a 30 per cent increase in the volume of sales for the period to date as compared with the same period in 1924. Another has gained appreciably in the amount of repair work and has increased his force to meet incoming orders.

Electric street lighting and industrial heating continue to gain ground. Electric refrigeration is active and many apartments are interested in installations. During the past week one prominent central-station company placed an order for seventy-eight; in addition, many inquiries are being received. Oil-burning apparatus is experiencing a similar trend in growth. Domestic household appliance sales are spotty, though ranges are moving in good volume. Washing machines, flatirons and cleaners show an encouraging trend. Radio supplies are selling with quickening vigor, and a large distributor reports that preparations are being made to meet an unparalleled activity in this line of electrical supplies during the coming season.

Activities of the Trade

Smith Corporation to Conduct Water-Hammer Tests

Tests which will simulate the effect of water hammer will be conducted by the A. O. Smith Corporation on penstock piping at its plant in Milwaukee on September 28. About fifty members of the American Society of Mechanical Engineers and some engineers from power companies on the Pacific Coast will be present to observe the results. Hydraulic pressure will be built up on some of the test piping to a value of 2,000 lb. per sq.in. and will be released and reapplied at the rate of 120 times per minute. Records will be taken and the piping later examined to determine the extent and degree of distortion if any.

Pittsburgh Transformer Company Holds Sales Convention

The Pittsburgh Transformer Company held a sales convention at Pittsburgh on August 28 and 29, which was attended by most of the district managers and principal jobbers. The morning of the first day was given over to an inspection of the company's four plants. A luncheon was served at noon, and after that the meeting was addressed by the president of the company, R. V. Bingay; by C. V. Edwards of New York, a director, and by G. N. Brown, vice-president in charge of sales.

There were about sixty representatives present, covering the sales organization of the company from coast to coast. H. L. Eicher was present from Seattle and J. W. Johnston from Boston, as far apart as two representatives can be in the United States. Saturday morning and afternoon was devoted to further inspection of the factories and individual sales discussions, and Saturday evening the convention ended with the dedication of the new Manchester plant of the company.

California Wholesale Electric Opens Establishment

A new electrical supply jobbing house has been recently established in Los Angeles by five former employees of the Pacific States Electric Company. The company is incorporated under the name of the California Wholesale Electric Company. It has leased a recently completed two-story brick building at 413 East Eleventh Street. The company is handling standard lines of merchandise and announces that it is following the trade policies practiced by the highest type of supply jobbers.

H. C. Chapman, president of the concern, has been district treasurer of the Pacific States Electric Company for the past ten years; E. G. Snow, vice-president, had been with that company for fifteen years in various capacities; Tom Slee, secretary-treasurer, was chief accountant in the former company for twelve years and later assistant district treasurer; W. D. Hughes, assistant secretary, was with the Pacific States Company for more than

five years, and J. G. Cook, the other member of the firm, had been a salesman for the same company for several years.

Marlin-Rockwell Acquires Strom Ball Bearing Company

Since August 24 the plant, property and good will of the Strom Ball Bearing Manufacturing Company, 4527 Palmer Street, Chicago, have been acquired by the Marlin-Rockwell Corporation, Jamestown, N. Y. The business of the Strom company will be conducted exactly as heretofore under the direction of the same personnel and department heads. There will be no change in the policy or the conduct of the business. The same lines of bearings under the Strom trade name will be continued as at present.

Western Appraisal Company to Operate on Pacific Coast

The Western Appraisal Company has been recently organized by a group of engineers to make appraisals of industrial, commercial, public utility and other properties. The company has opened offices at 725 Petroleum Securities Building, Tenth and Flower Streets, Los Angeles, and 216 Pine Street, San Francisco. The officers and directors are: R. A. Thompson, president; H. G. Butler, vice-president; Arthur R. Kelley, treasurer, and G. R. Kenny, secretary and general manager.

The company also announces that it is prepared to render additional services such as the analysis and construction of public utility rate schedules, study of revenue and expenses for rate proceedings before public service commissions and courts, reports on properties, analysis of financial structure and recommendation for financial programs, etc.

Western Red Cedar Association Establishes Research Division

The rapidly growing demand for Western red-cedar poles has forced the pole producers and distributors to devote a major portion of their energies to accelerate production. With the gradual approach of the balance between consumption and production, greater attention can be given to furthering the development of higher standards and the more economical utilization of the product. This has required the establishment of active research into all phases and the dissemination of the experience and information thereby made available.

At a special meeting of the Western Red Cedar Association recently held at Spokane, Wash., for the purpose of devising means for creating such a service a research division was established and Kurt C. Barth was appointed director, with offices at 5 South Wabash Avenue, Chicago.

The program outlined for the research division contemplates complete service alike to the consumers and the producers—providing an agency whose sole duty is to advance their mutual interests. Among the more important features are the co-ordination of producing conditions with consumers' needs and vice versa and collection of physical data, service records and all technical information helpful to engineers and buyers responsible for the employment and purchase of Western red-cedar poles. Constant attention is to be given to all factors of production, distribution and consumption, including preservative treatment, so that the product of each member of the association may be maintained at the highest standard of quality and value. To this end every effort will be made to cooperate with all technical and other organizations interested in conductor supports.

From time to time pertinent literature will be made available for general distribution, but in a large measure the service offered to pole consumers must of necessity be of a more personal nature, dealing particularly with specific problems.

New Company to Specialize in Bus and Switch Structures

The Bus Structure Company has been organized with offices at 21 Besse Place, Springfield, Mass., to specialize in the building of bus structures, switch cells, barriers, and other electrical compartments for generating plants and substations, utilizing unit steel forms in this work. C. W. Moody is president and manager, R. F. Moody being secretary and treasurer.

Cowan Truck Company Appoints Representatives

The Cowan Truck Company, Holyoke, Mass., announces the appointment of the following sales representatives: For Nebraska and western Iowa, D. H. Braymer Equipment Company, 727 Woodmen of the World Building, Omaha; for Minnesota, O'Brien & Bushnell, Pioneer Building, St. Paul; for eastern Missouri and southern Illinois, Corliss Supply & Manufacturing Company, 1906 Oliver Street, St. Louis; for Georgia, Tuttle & McCord, 1000 Marietta Street, Atlanta. The New York City office of the company has been moved to 381 Fourth Avenue and is now in charge of W. N. Page, manager, and C. E. Barnes, northern New Jersey representative, now makes his headquarters at this address.

Canadian General Electric Obtains Large Contract

One of the largest contracts for electrical equipment placed in Canada for some time was recently awarded to the Canadian General Electric Company by the Aluminum Company of Canada for its new plant at Chute à Caron, Quebec. The order covers eighteen synchronous converters, each of 3,600 kw. capacity; twelve step-up and step-down transformers, each of 25,000 kva., with a primary voltage of 154,000, and ten transformers, each of 7,500 kva. capacity. The converters will be the largest units of this type in Canada, and interesting features are incorporated for starting any of them automatically. The high-voltage transformers will have both the greatest capacity and the highest primary voltage of any transformers in the Dominion. It is stated that the plant of the Aluminum Company is expected to require ultimately electrical apparatus of many times the capacity of the equipment covered by the present order.

The National Electric Manufacturing Company, Pittsburgh, manufacturer of "Syntron" electric hammers, announces that since June it has been publishing a monthly house organ that will be sent to any one interested in reducing labor costs.

The Ohio Brass Company, Mansfield, Ohio, manufacturer of insulators, etc., has awarded a general contract for a two-story-and-basement addition to its plant, 55 ft. x 60 ft., estimated to cost $35,000.

The Pacific States Electric Company recently announced the opening of a new office and warehouse at 206 West Market Street, San Diego, Cal., which will carry full stocks and render intensive service in the extreme southern territory of California.

The Westinghouse Electric & Manufacturing Company is establishing an electrical sevice station in Springfield, Mass., to serve the entire territory of western New England except points south of New Britain, Conn., which will be serviced from New Haven when redistricting arrangements are completed. With this new Springfield station is being consolidated the Hartford station, the machinery and most of the service force being moved to Springfield. H. G. Lewis, formerly of Hartford, will be in charge at Springfield.

The Kuhlman Electric Company, Bay City, Mich., announces that it has received the order for the transformers to be used in connection with the 220 2,500-cp. "Mazda" incandescent lamps which will be installed on Superior Avenue, Cleveland.

The Excel Electric Company, Muncie, Ind., manufacturer of the Excel electric cooker, announces that it has opened an office at 1133 Broadway, room 915, in charge of E. F. Moran.

The General Electric Company has won a suit brought against the Central Electric Lamp Company, Milwaukee, in which the charge was made that the Milwaukee concern was infringing on tungsten-lamp patent rights held by the company. A permanent injunction was handed down by Federal Judge F. A. Geiger.

The Western Electric Company has acquired a building at 570 Indian Street, Savannah, Ga., and will remodel and equip it for a local branch and distributing headquarters.

The Commercial Truck Company, Hunting Park and Rising Sun Avenue, Philadelphia, announces that F. F. Espenschied, who has been representing the company in Pittsburgh for a number of years, has been made manager of the Philadelphia territory sales office.

The Anderson-Pitt Corporation, 2609 Walnut Street, Kansas City, Mo., announces that it has placed on the market a bowl-type radiant heater with

a new type of heating element having all of the heating coil facing the reflector. The heater consumes 660 watts at 110 volts. It can also be furnished for operation at 220 volts.

The Riley Stoker Corporation, Worcester, Mass., announces the appointment of the two following new agents to handle the Riley, Jones, Murphy and Harrington stokers: The Heating & Ventilating Equipment Company, 1018 Fourth Avenue, South Seattle, Wash., for the States of Oregon and Washington, and the Tennant Company, 1111 Union National Bank Building, Houston, Tex., for southern Texas.

The General Electric Company has last month paid supplementary compensation to its employees, at all the factories and offices of the company, totaling $1,247,496. The number of employees participating in the disbursement was 29,558. The payments cover the six months which ended June 30 and are being made only to those employees who have five years or more of continuous service with the company. The amounts paid to each individual constitute 5 per cent of the individual's earnings during the period covered.

The American Electrical Supply Company, Chicago, jobber, has purchased the Robb-Dayton Electrical Company, Moline, Ill., in which for some time it has had a considerable interest. The business is now being operated as a branch of the company. K. R. Hills, who was associated with the Robb-Dayton Company for several years, has been made manager of this new branch store, which will operate as both a wholesale and a retail establishment in electrical and radio supplies.

The Line Material Company, South Milwaukee, Wis., manufacturer of electric line equipment, has acquired a tract of about two acres of land at Clark Summit, Pa., as a site for a new branch plant, for which plans will be prepared at once. The initial structures will consist of two main buildings, estimated to cost about $200,000, with machinery.

The Westinghouse Lamp Company has disposed of its factory at Middletown, Conn., comprising about 73,775 sq.ft. of floor space, to the Progressive Realty Company, Middletown.

The Edison Electric Appliance Company, 5600 W. Taylor Street, Chicago, through P. H. Booth, district manager, is conducting a series of inspirational meetings throughout the northern section of California for the purpose of bringing out a better understanding of the merits of "Hotpoint" ranges, water heaters and cookers among central-station salesmen.

The Southern New York Electrical Supply Corporation, 78 State Street, Binghamton, N. Y., announces that a branch house carrying a full line of electrical supplies will be opened at 240 W. Water Street, Elmira, N. Y., on September 1. The company announces that this is one of a series of branches that will be established.

Manning, Bowman & Company, Meriden, Conn., has placed on the market a tobaco lighter suitable for either pipes, cigars or cigarettes, to retail for $5.

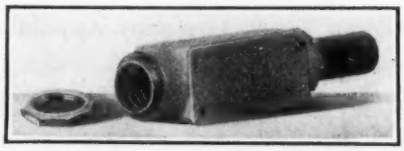
New Equipment Available

Meter Service Switch

A meter service switch of the single fusing type for use where secondary lines are grounded and a solid neutral is required has been placed on the market by the Wadsworth Electric Manufacturing Company, Covington, Ky. The cabinet is of standardized dimensions with regard to accommodating knockout ends and meter trims of other manufacturers. These switches are so designed that the fuses can be made accessible through a sliding door in the cover of the switch cabinet. This door cannot be opened when the switch is closed nor can the switch be closed when the sliding door is open. The fuses are dead when the switch is open.

Conduit Fitting

A new type of threadless conduit fitting, known as the "Kondu-Box," has been placed on the market by the Erie Malleable Iron Company, Erie, Pa. The "Kondu-Box" is made of malleable iron and a bushing and lock nut are used to hold the conduit in position. A ground is secured by means of ridges or ground rings on the interior of the bushing, that are forced through the enamel on



THREADLESS CONDUIT FITTING

the conduit as the lock nut is tightened on the bushing, which is case-hardened. The bushing is made with a machined bead against which the conduit rests.

With the use of this new fitting the change of a fitting, after a line is installed, can be accomplished without removing the line of conduit. A light-wall tubing can also be used with this device as the cutting of threads is unnecessary. The company is also placing on the market a complete line of threadless couplings as well as adapters for use with standard steel knock-out boxes and an adapter bushing for use on flexible conductors.

Floodlighting Projector

A new type of "Golden Glow" floodlighting projector, known as the type ELA-1419, for railroad yard or other similar service, has been placed on the market by the Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia. The housing is made of cast aluminum alloy, and a "Golden Glow" glass reflector is mounted in the door, which opens from the back of the case. The door is made weather-tight without a gasket by a series of baffles with a machined surface fit. The unit is said to have ample ventilation and is provided with an external focusing mechanism. When fitted with a 1,000-watt, 115-volt PS-52 standard multiple lamp the unit has a maximum useful range of 3,000 ft. to 3,500 ft. when mounted on towers 70 ft. to 90 ft. high.

Oil Engine

The building of the new Whaley constant-pressure oil engine has just been completed by the Sun Shipbuilding & Dry Dock Company, Chester, Pa. The engine is described as a single-acting, four-cylinder, two-cycle machine designed to develop 750 hp. It is a vertical reversing engine, conventional in design, though it is said to follow the best steam-engine practice. It is distinguished from all other heavy-oil engines by the fact that the cylinder clearance, at the time of the fuel injection, is opened by a piston valve to communication with a static receiver having many times the capacity of the cylinder clearance. This presents a condition exactly the opposite to that in all present internal-combustion engines, where the basis of operation is on a trapped charge. In the Whaley engine the piston valve to the static receiver is open as long as the fuel is being injected.

The engine is now undergoing its shop test, and it is expected that the trials will be completed in time to present all technical details of the engine and the results of performance before the winter meetings of the national engineering societies.

The Whaley Engine Patents, Inc., owns the patents for the Western Hemisphere, the International Whaley Engine Corporation owns the patent rights for the Eastern Hemisphere, the American Locomotive Company owns the exclusive license for the use of the Whaley engine on rails for the Western Hemisphere, and the Sun Shipbuilding & Dry Dock Company has a contract for building these engines for marine and stationary use in the United States.

Choke Coil and Grounding Switch

A combination choke-coil and grounding-switch unit has been placed on the market by the Delta-Star Electric Company, 2433 Fulton Street, Chicago. The switch is of the stick-operated type and is provided with a flexible connection to the channel base. These units are designed for operation on 50,000-volt lines.

Panelboard.—A residence-type panelboard with the fuse-block unit built of sections and readily removable has been placed on the market by the Westinghouse Electric & Manufacturing Company. The panelboard is built in two types—type R, for a two-wire system, double-fused for four, six, eight, ten and twelve circuits, and type NR, for a three-wire system, single-fused for four, eight or twelve circuits.

New Trade Literature

CABLES.—The Hazard Manufacturing Company, Wilkes-Barre, Pa., is distributing two booklets, one entitled "Hazard Steel-Tape Armored Parkway Cable" and the other "Hazard Spiralweave." These describe respectively the Hazard steel-tape armored parkway cable for street-lighting systems, power transmission, signaling systems, etc., and the "Spiralweave" for covering of Hazard wires and cables for use where wires are subjected to constant friction, as in the case of portable cables, mine-shaft cables, battery charging, etc.

VACUUM RECORDERS.—Bulletin No. 140 issued by the Uehling Instrument Company, 473 Getty Avenue, Paterson, N. J., describes and illustrates the Uehling type "D" vacuum recorder for use in electric lighting and industrial plants.

SWITCHES.—Bulletin No. 603 issued by the Electric Power Equipment Corporation, Philadelphia, describes and illustrates its type "R.T." meter and relay test switches. It contains numerous diagrams showing various applications of the "R.T" switches and also suggested methods of using the "R.T." switches in relay and meter testing.

STATIC CONDENSERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a revised publication, known as publication L-20,044-B on its "LD" static condensers, which covers the subject of losses due to low power factor, their correction and the economic application of static condensers.

CRANES AND SHOVELS.—The Harnischfeger Corporation, successor to the Pawling & Harnischfeger Company, Milwaukee, is distributing bulletins Nos. 82-X and 41-X, describing the "P. & H." power shovels and corduroy cranes respectively.

POWER-FACTOR CORRECTION. — "Capacitors" is the title of bulletin No. GEA-77, issued by the General Electric Company, Schenectady, N. Y., describing the value of this device in power-factor correction on electric generating and distributing systems and for direct installation at motor terminals on low-voltage circuits.

ELECTRICAL SUPPLIES AND APPLIANCES.—E. B. Latham & Company, 550 Pearl Street, New York City, are distributing catalog No. 50, covering electrical supplies, appliances and radio equipment distributed by the company. Useful information regarding units of measure, electrical units, equivalent value in different units, definitions of electrical units, diameter of rubber-covered wires, etc., is included.

CENTRIFUGAL PUMPS.—Bulletin No. 31 issued by the Erie Pump & Engine Works, Media, N. Y., describes and illustrates the Erie centrifugal pumps for general water supply, boiler feeding, irrigation, dredging, etc.

STOKER.—"A Long Step Forward" is the title of a bulletin issued by the Advance Machinery & Supply Company, Railroad Building, Denver, Col., covering the Advance stoker. It contains illustrations showing different views of the stoker and how it operates.

GLOBE REMOVERS. — The Pierpont Manufacturing Company, Pana, Ill., is distributing a folder describing its electric light globe removers, designed for removing globes from street lamps, from ceilings in stores, factories, churches, theaters, etc., and for changing globes in electric signs.

HANDBOOK FOR FIELD MEN IN THE PETROLEUM INDUSTRY.—To give the field men of the petroleum industry an elementary knowledge of electricity the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has compiled some necessary information and has published it in pocket handbook form. The publication starts at the very beginning by explaining and defining simple terms, such as "Ohm's law," "voltage," "power factor" and "current"; describes the methods of caring for and installing electrical equipment and contains a number of wiring diagrams and data tables.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Prague, Czechoslovakia (No. 16,604), for storage batteries for automobiles.

An agency is desired in Berlin, Germany (No. 16,591), for electric blowers, machine tools and transmission equipment.

An agency is desired in Alexandria, Egypt (No. 16,587), for electrical apparatus and for oil and Diesel engines.

Purchase and agency is desired in Valencia, Spain (No. 16,607), for radio sets and parts.

Purchase or agency is desired in Rome, Italy (No. 16,609), for radio sets and parts.

An agency is desired in Vancouver, Canada (No. 16,652), for radio sets and parts.

Purchase is desired in Ghent, Belgium (No. 16,608), of electric refrigerators for homes and of snap and knife switches.

Purchase is desired in Geneva, Switzerland (No. 16,611), of copper ingot for making wire, plates and bars for electrical use.

ELECTRIC GENERATING UNIT AND OIL ENGINE FOR NEW ZEALAND.—Tenders will be received by the Public Works Department, Wellington, New Zealand, until Oct. 20 for a crude-oil engine and alternator.

ELECTRIC CRANE FOR NEW SOUTH WALES (AUSTRALIA) RAILWAYS.—Tenders will be received by the New South Wales Railways and Tramways Commissioners, Sydney, Australia, until Nov. 11 for one 5-ton, 3-motor electric overhead traveling crane with a span of 56 ft. 2 in. for the New South Wales government railways.

PROPOSED TRANSMISSION LINE FOR GUATEMALA.—Arrangements have been made by the government of Guatemala for surveys for the erection of a transmission line from the government-owned plant at Santa Maria to Patsun, according to Arthur H. Geissler, Minister to Guatemala. The government also contemplates the construction of another line from Santa Maria to Retalhulen. For further information address the Ministerior de Fomento, Guatemala City, Guatemala.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

LANCASTER, N. H.—The Twin State Gas & Electric Company, Brattleboro, Vt., which recently acquired the property of the Jones & Linscott Electric Company, plans extensions to its transmission lines in this district.

NEW BEDFORD, MASS.—The National Spun Silk Company has petitioned the City Council to install ornamental lamps on Brook and Dean Streets.

WATERBURY, CONN.—The Waterbury Steel Ball Company has taken out a permit to erect a building, to be used as a motor house.

Middle Atlantic States

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company has applied to the Public Service Commission for approval of franchises to supply electricity in the towns of Freedom, South Valley, Elko and Redhouse, already granted by the Towns Boards.

LOCKPORT, N. Y.—The Lockport Paper Company plans to build a power plant in connection with rebuilding its shingle mill, recently destroyed by fire.

OSWEGO, N. Y.—Application has been made to the Public Service Commission by E. D. Whitney, vice-president of the General Development Company, Oswego, for permission to construct transmission lines and for approval of exercise of rights under a franchise granted by the city of Oswego to furnish electricity here.

POTSDAM, N. Y.—Bids will be received by the Municipal Board until Sept. 15 for construction of four concrete rapid mechanical filters of 2,000,000 gallons per day capacity, clear well, etc., and for super and substructure for two 200-hp. hydro-electric units joined to filter plant. Separate proposals will be received at the same time for complete filter equipment, piping, pumps, motors, etc., for the above plant. Bogart & Pohl, 30 Church Street, New York City, are engineers.

ATLANTIC CITY, N. J. — Plans have been prepared by the Leeds & Lippincott Company, operating the Chalfonte-Haddon Hall Hotel, for a power plant, to cost about $200,000. The Stewart A. Jellett Company, Twelfth and Locust Streets, Philadelphia, is engineer.

BAYONNE, N. J. — The Department of Public Improvements has plans under way for the erection of an electric signal station, to cost about $45,000. H. Adleman and Louis Quinn, 229 Broad Street, Elizabeth, are architects.

ORANGE, N. J.—The City Council plans to install an ornamental lighting system, with underground conduits, in the Seven Oaks Park section.

TOMS RIVER, N. J.—The Toms River Electric Company plans to build a hydro-electric plant on the Toms River, near Barnegat Bay, to cost about $200,000, and a transmission line.

MASONTOWN, PA. — Bids will be received by the Borough Council until Sept. 21 for extensions and improvements to water works, including the installation of two 450-gallons per minute motor-driven pumps. Morris Knowles, Inc., Westinghouse Building, Pittsburgh, is engineer.

NORRISTOWN, PA.—The installation of an ornamental lighting system on Marshall Street, from Corson Street to Hawes Avenue, covering five blocks, is under consideration by the West End Merchants' Association.

PHILADELPHIA, PA.—Plans have been filed by the Pennsylvania Salt Manufacturing Company, Widener Building, for the construction of a sub-station on Shunk Street.

WEIRTON, W. VA.—The Weirton Steel Company will install electric power equipment in connection with proposed extensions in its mills, to cost about $10,000,000.

HARRISONBURG, VA.—Engineers who have made a survey of the municipal electric plant for the Virginia Western Power Company, with the approval of the City Council, recommend improvements costing about $130,000 as follows: $90,000 for a new 1,000-hp. steam-driven unit, $30,000 for making the hydro-electric plant more flood-proof, and $10,000 for a parital rebuilding of the distribution system in the city.

SOUTH BOSTON, VA. — The electric plants recently taken over by the Halifax Power Company in Emporia, Victoria, Chase City, Blackstone, Brookneal and others, are now being interconnected and will be supplied eventually from two central generating stations on the Staunton River at Brookneal. The lines of the Halifax Power Company will be connected with those of the Virginia Railway & Power Company at Roanoke Rapids, which has agreed to purchase all electric power generated by the former company in excess of its requirements.

WARRENTON, VA.—A suit has been filed by the Virginia Northern Power Company to condemn a water site on the Rappahannock River, near Kelly's Ford, where it proposes to build a 45-ft. dam in connection with a hydro-electric development, to cost about $200,000.

WOODSTOCK, VA.—The Valley Light & Power Company, Woodstock, the Weyers Cave (Va.), the F. A. Shank Company, Timberville, and the T. A. Andrick Company, New Market, which supply practically all electric service to small communities in northern Augusta, Rockingham and Shenandoah Counties, have been consolidated under the name of the Shenandoah River Power Company, Inc. The properties will be operated by Ives & Davidson, 15 Park Row, New York City, consulting engineers.

WASHINGTON, D. C. — Bids will be received by the Chief Signal Officer, United States Army, Washington, until Sept. 21, for electric supplies, including cable suspension clamps, porcelain knobs, knife switches, etc. (Proposal 20730-B).

WASHINGTON, D. C. — Bids will be received by the United States Coast Guard, Washington, until Sept. 30, for two direct-current generators, and one double armature direct-current motor, with controls and appurtenances for electric ship service.

North Central States

ONTONAGON, MICH.—The City Council is planning to install electric lamps on a portion of River Street.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Sept. 18 for steel gratings, runways, railings, pipe supports and platforms for the Division of Light and Power.

CLEVELAND, OHIO.—The City Council is considering submitting a proposal to issue $500,000 in bonds to the voters at the election to be held next November for extension to the municipal electric lighting plant, including a new substation and extension to the ornamental lighting system.

MONROE FALLS, OHIO.—The Monroe Falls Paper Company will install electric power equipment in connection with the proposed rebuilding of its plant, recently damaged by fire with loss about $100,000, including equipment.

MOREHEAD, KY.—Plans have been prepared by Joseph & Joseph, Francis Building, Louisville, architects, for a power plant at the local college, to cost about $150,000.

CHICAGO, ILL.—Plans have been filed by the Commonwealth Edison Company for the construction of a substation at 1,620 Prairie Avenue, to cost about $80,000.

OAK PARK, ILL.—The Department of Public Works is considering the installation of an ornamental lighting system, consisting of 3,300 standards. The Randolph-Perkins Company, 38 Dearborn Street, Chicago, is engineer.

DULUTH, MINN.—Plans have been filed by the Zenith Furnace Company, Fifty-eighth Avenue, West, for a substation at its plant.

FREEBORN, MINN. — The Interstate Power Company, Chicago, plans to erect a transmission line between Freeborn and Alden and a distributing system in Freeborn.

CORYDON, IOWA.—The Iowa Southern Utilities Company, Centerville, has applied for permission to erect a transmission line for local service.

DAVENPORT, IOWA.—The City Lighting Committee is considering extensions and improvements in the street-lighting system.

MALDEN, MO.—Bonds to the amount of $50,000 have been voted for improvements to the municipal electric plant and water works. F. L. Wilcox, Chemical Building, St. Louis, is consulting engineer.

ST. LOUIS, MO.—Plans are being considered by the St. Louis Car Company for rebuilding its auxiliary power plant, recently destroyed by fire.

Southern States

CONCORD, N. C.—Plans for the proposed local furniture factory to be erected by W. M. Linker and associates, at a cost of about $100,000, include a power house.

ELIZABETH CITY, N. C.—Bids will be received jointly by the Utilities Commission and the Mayor and Board of Aldermen, at the Chamber of Commerce, Elizabeth City, until Sept. 23 for the construction of sanitary sewerage systems in zones 1 and 3, including two pumping stations, furnishing motor-driven sewage pumping units, steel water tank, etc. William C. Olsen, Raleigh, is consulting engineer.

SNOW HILL, N. C.—J. S. Banks & Company, 526 Connecticut Avenue, Norfolk, Va., write the ELECTRICAL WORLD, that they have just completed the erection of a 13,200-volt transmission line and substations, and rebuilt the distribution system for the town of Snow Hill. Electricity for operating the system is purchased from the municipal plant at Kinston.

WINSTON-SALEM, N. C. — Improvements to cost about $100,000 are contemplated to the property of the Winston-Salem Gas & Electric Company, which has recently been acquired by the General Gas & Electric Corporation, 50 Pine Street, New York City. The former company will be operated under the direction of the North Carolina Public Service Company, Greensboro.

GREENVILLE, S. C. — Plans for the proposed local textile mill to be built by the Piedmont Plush Mills, Inc., at a cost of about $150,000, include a power plant. J. E. Sirrine & Company, Greenville, are architects and engineers.

MACCLENNY, FLA. — Bonds to the amount of $25,000 have been voted for the installation of electric light and ice plants.

OJUS, FLA.—Plans are under consideration by the Fulford-Ojus Civic Club for the installation of an ornamental lighting system along the Dixie Highway, between Ojus and Fulford.

SEBRING, FLA.—Bids will be received by the Mayor and Council at the office of the town clerk, until Sept. 28 for an oil engine of 1,000 hp. to 1,500 hp., directly connected to an alternating-current generator, 2,300 volts, 3-phase, 60 cycles, without exciter, but with generator panel complete with switches, instruments, etc. Bids will also be received at the same time and place for one 50-kw. direct-connected, 125-volt, direct-current exciter set, to include motor and exciter panel, switches, instruments, etc. Motor to be 2,300 volts, three phase, 60 cycles.

CHATTANOOGA, TENN. — The Crane Enamelware Company, Chestnut Street, plans to install electric power equipment in connection with additions to its plant in the Alton Park section, to cost about $650,000.

WATERTOWN, TENN. — Bids will be received by the City Council until Sept. 16 for construction of a municipal water works system, including one or more deep wells, and equipping same with automatic electrically driven deep well pumps or the improvement of the existing wells, and electrically driven centrifugal fire pump with remote control, steel standpipe, distribution system, etc. The Ambler Engineering Company, Richmond, Va., is engineer.

CUBA, ALA.—The Alabama Power Company, Birmingham, plans to build a 110,000-volt substation about 2 miles from Cuba, which will serve electricity in Livingston and York, in addition to Cuba, and which will be served by a 2-mile, 2,300-volt single-phase line.

DEMOPOLIS, ALA.—The Warrior Portland Cement Company, recently formed to take over the local plant of the Gulf States Portland Cement Company, plans to install electric power equipment in connection with proposed extensions, to cost about $500,000.

FLORENCE, ALA.—Bids will be received at the United States Engineer Office, Florence, until Sept. 24 for furnishing and installing motor-driven air compressors in the power house and lock operator's house of Wilson Dam on the Tennessee River.

FORT PAYNE, ALA.—The Fort Payne Utilities Company, which recently acquired the property of the Fort Payne Light & Power Company, contemplates extensions in its system.

NEW BROCKTON, ALA. — The Gulf Electric Company, Birmingham, is planning to erect a transmission line from Enterprise to New Brockton, a distance of about 9 miles. A local distribution system will be installed.

WETUMPKA, ALA. — Permission has been granted by the Alabama Public Service Commission to the Alabama Power Company, Birmingham, to construct a hydro-electric development at Lock 18 on the Coosa River, near Wetumpka. The plans call for an initial installation of 73,000 hp., at a cost of $13,250,000.

GREENVILLE, MISS.—The Mississippi Power & Light Company contemplates rebuilding its local substation, recently damaged by fire with a loss of about $30,000.

JACKSON, MISS.—The Mississippi River Power & Light Company, Jackson, has acquired the municipal electric light plants in Rosedale and Tutwiler.

ASHDOWN, ARK.—The erection of a high-tension transmission line connecting Ashdown and Texarkana, is under consideration by the Texas Central Power Company, San Antonio.

BOSSIER CITY, LA.—Plans are being considered by the Red River Lumber Company to rebuild its planing mill and power plant, recently destroyed by fire. The loss is estimated at about $50,000.

CEDAR GROVE, LA.—The Red River Lumber Company, Shreveport, is planning to build a power house at its proposed local planing mill, to cost about $75,000.

HINTON, OKLA.—Bonds to the amount of $25,000 have been voted for extensions and improvements in the municipal electric lighting system. The Benham Engineering Company, Gumbel Building, Kansas City, Mo., is engineer.

MADILL, OKLA.—The Oklahoma Gas & Electric Company, Oklahoma City, which recently acquired the property of the Consumers Light & Power Company, is planning extensions in its transmission lines and distributing system in this district.

RANDLETT, OKLA.—The City Council is considering a bond issue of $11,000 to establish an electric lighting system in Randlett. It is proposed to build a local distributing system and to erect a high-tension transmission line, 4½ miles long, to connect with the Temple-Grandfield line of the Southwestern Light & Power Company, Lawton.

GONZALES, TEX.—Plans are being prepared by the Middle West Utilities Company, Frost Building, San Antonio, for an addition to local power plant and dam, including the installation of three 500-hp. waterwheels, etc., to cost about $35,000, and also a 30-ton ice and filter plant, to cost about $45,000.

SAN ANTONIO, TEX.—Plans for the rebuilding of the oil refinery of the Texas Refining Company, recently destroyed by fire, with a loss of about $350,000, include a power plant.

SEAGOVILLE, TEX.—The installation of an improved street-lighting system is under consideration by the Merchants' Credit Association. The Bryant Power & Light Company is now furnishing local commercial service.

WACO, TEX.—Plans for the proposed extensions to the municipal waterworks, to cost about $1,000,000, include new pumping equipment.

Pacific and Mountain States

DEER PARK, WASH.—The construction of a new hydro-electric plant on the Little Spokane River, about 35 miles from Spokane, to develop about 1,000 hp., will be started by the Mount Spokane Power Company early next year. The cost is estimated at about $45,000.

MARMOT, ORE.—The Oregon-California Hydroelectric Company, Woodlark Building, Portland, has tentative plans for a hydro-electric power development on the Sandy River, near Marmot, to cost about $10,000,000, with steel tower transmission line.

BERKELEY, CAL.—The City Council is considering the installation of an electric traffic signal system in the business district.

COLUSA, CAL.—The Pacific Gas & Electric Company, San Francisco, has appropriated $67,300, for the erection of additional transmission lines in this district.

LOS ANGELES, CAL. — The Southern California Edison Company will soon begin the construction of a 230-kva. steel tower transmission line between its Big Creek and San Joaquin power stations and Los Angeles, about 231 miles, to cost about $10,000,000.

LOS ANGELES, CAL.—The City Council has adopted an ordinance providing for the installation of ornamental lamps on Browning Boulevard, from Vermont and Normandie Avenues, using concrete standards, and also on portions of Pico Street and Occidental Boulevard, using pressed steel standards.

LOS ANGELES, CAL.—The Board of Water and Power Commissioners has instructed E. S. Scattergood, chief engineer of the Bureau of Power and Light to prepare plans for a steam power plant. This plant is to be used as a standby station in case of interruptions on the transmission lines supplying the municipal distribution system. As yet no definite steps have been taken.

OAKLAND, CAL.—The City Council is considering the installation of an electric traffic system in the business district.

OAKLAND, CAL.—The Willys-Overland Company, 1299 Bush Street, San Francisco, will install electric power equipment in its proposed local plant at East Fourteenth Street and Fifty-seventh Avenue, to cost about $500,000. The Austin Company, 244 Kearny Street, San Francisco, is engineer and contractor.

SANTA CRUZ, CAL.—The City Council is considering the installation of an improved lighting system on a number of city streets.

VENICE, CAL.—Plans are under way for the installation of an improved lighting system in District No. 1, including all streets north of Mildred Avenue and south of the Pacific Electric short line. Lawrence Truckey is engineer in charge.

WHITTIER, CAL.—The City Council is considering the installation of a municipal fire alarm system.

MESA, ARIZ.—Bids will be received by the City Council until Sept. 21, for one 1,000-kw. frequency changer set, one 3-phase lightning arrester, switchboard, and three 40,000/6,600-volt transformers. The Weiland Engineering Company, Thatcher Building, Pueblo, Colo., is engineer.

ANACONDA, MONT.—The City Council is considering the installation of ornamental lamps on Harrison Avenue.

DODSON, MONT.—The Town Council is considering a bond issue of $6,000 for the installation of a municipal lighting system.

NASHUA, MONT.—Plans are under consideration by the City Council for the construction of a municipal electric plant.

SANTA FÉ, N. M.—The Northern New Mexico Company, recently incorporated, plans to build a large power plant to supply electricity in Santa Fé, Albuquerque and cities within a radius of 100 miles. W. C. Thornburg and M. D. Bowman, Toledo, Ohio, and William A. Bayer, Santa Fé, are among the incorporators.

Electrical Patents

Announced by U. S. Patent Office

(Issued August 11, 1925)

1,549,253. ELECTRODE FOR ELECTRON-DISCHARGE DEVICES; W. G. Houskeeper, New York, N. Y. App. filed Oct. 5, 1920.

1,549,291. LIGHT BRACKET; C. E. Broman, Grand Rapids, Mich. App. filed Sept. 17, 1923. Swinging bracket.

1,549,300. CIRCUIT-CONTINUING DEVICE; H. A. Douglas, Bronson, Mich. App. filed April 4, 1921. For miniature lamps.

1,549,301. REVERSING-CURRENT COLLECTOR; J. N. Duncan, Boone, Iowa. App. filed Dec. 26, 1922. For electric railways.

1,549,310. HIGH-FREQUENCY SIGNAL-RECEIVING SYSTEM; Le Roy E. Humphries, Atlanta, Ga. App. filed Oct. 22, 1923.

1,549,324. MOTOR-CONTROLLING APPARATUS; C. W. Moore, Roslyn, Pa. App. filed May 2, 1924. With speed-varying means.

1,549,333. LIGHTING FIXTURE; F. H. Robinson, Bayonne, N. J. App. filed Feb. 7, 1924.

1,549,337. SYNCHRONOUS MOTOR; M. E. Thompson, Ridgway, Pa. App. filed Jan. 31, 1922. For induction-motor starting with high torque.

1,549,362. ELECTRIC ROTARY SWITCH; G. Jachmann, Berlin-Friedenau, Germany. App. filed June 19, 1923.

1,549,363. SUSPENDING AND FEEDING DEVICE FOR TROLLEY WIRES; L. Johnston, Cincinnati, Ohio. App. filed July 5, 1923.

1,549,365. ELECTRIC SWITCH; S. Kobzy, Chicago, Ill. App. filed Jan. 5, 1920. For controlling a plurality of electric circuits.

1,549,381. STAND FOR ELECTRIC IRONS; G. B. Ratterman, New York, N. Y. App. filed Nov. 28, 1922.

1,549,394. RESISTANCE CONDUCTOR AND MANUFACTURING PROCESS AND MATERIAL THEREFOR; W. S. Tyler, Bridgeport, Conn. App. filed Jan. 20, 1923.

1,549,397. SMOKER'S DEVICE; C. A. Whitley, Newark, N. J. App. filed Nov. 6, 1924.

1,549,416. RHEOSTAT; T. W. Halliday, Rupert, Idaho. App. filed Oct. 23, 1923. Indicates the amount of resistance introduced into the circuit.

1,549,431. SEALING DEVICE FOR ELECTRODES OF ELECTRIC FURNACES; R. Beck, Resita, Rumania. App. filed May 1, 1924.

1,549,432. ELECTRIC LIGHT FIXTURE; A. A. Beidelman, Los Angeles, Cal. App. filed Aug. 27, 1923. Canopy for chandeliers.

1,549,433. ELECTRICAL FIXTURE-SUPPORTING DEVICE; R. B. Benjamin, Chicago Ill. App. filed July 1, 1921. For electrically and mechanically connecting a fixture in position with respect to a receptacle.

1,549,437. ELECTRIC PLUG RECEPTACLE; C. H. Bissell, Syracuse, N. Y. App. filed Feb. 7, 1920.

1,549,438. MOTOR-CONTROL SYSTEM; H. L. Blood, North Plainfield, N. J. App. filed Oct. 7, 1921. For motor operating a precision machine tool.

1,549,445. ELECTRIC SWITCH; C. F. Burgeson, Minneapolis, Minn. App. filed Nov. 13, 1924. Fused disconnecting switch.

1,549,449. ELECTRIC SWITCHING DEVICE; C. Christensen, Chicago, Ill. App. filed Aug. 30, 1920. Oil circuit breaker.

1,549,450. CONTROL SYSTEM FOR WELDING APPARATUS; W. B. Clarkson, Schenectady, N. Y App. filed March 3, 1925. Automatic.

1,549,456. ELECTRIC DISCHARGE INDICATOR; E. E. F. Creighton, Schenectady, N. Y. App. filed Feb. 11, 1922.

1,549,475. AUTOMATIC TELEGRAPH TRANSMITTER; J. L. Finch, Kahuku, Hawaii. App. filed Dec. 6, 1921.

1,549,477. DECREASING CROSS-TALK IN PHANTOM CIRCUITS; K. Fischer, Charlottenburg, Germany. App. filed July 2, 1923.

1,549,478. APPARATUS FOR THE PROTECTION OF ALTERNATING-ELECTRIC CURRENT SYSTEMS; A. Stewart Fitzgerald, Finchley, England. App. filed July 19, 1923.

1,549,525. SPACER FOR TRANSFORMER DISC COILS; W. H. Cooney, Pittsfield, Mass. App. filed Dec. 31, 1924.

1,549,547. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Aug. 15, 1921. High-potential oil switch.

1,549,551. ELECTRIC SWITCH LINING; H. J. H. Huber, Schenectady, N. Y. App. filed Jan. 21, 1921. For oil circuit breakers.

1,549,587. AMPLIFYING SYSTEM; H. B. Marvin, Schenectady, N. Y. App. filed Sept. 27, 1921. For amplifying small alternating potentials or currents and producing an indication of amplified effects.

1,549,590. METHOD OF FORMING AN ELECTRIC HEATING UNIT; F. H. McCormick, Oak Park, Ill. App. filed July 6, 1923. Resistance type.

1,549,612. AUTOMATIC STARTING DEVICE FOR ELECTRIC MOTORS; P. Rohde, Waidmannslust, Germany. App. filed March 14, 1924.

1,549,616. MOUNTING FOR SWITCH CONTACT MEMBERS; S. W. Severence, Pittsfield, Mass. App. filed Sept. 28, 1921. As in a controller.

1,549,628. HIGH-RESISTANCE CONDUCTOR FOR ELECTRICAL MACHINERY; H. W. Taylor, Rugby, England. App. filed March 27, 1922.

1,549,644. CIGAR LIGHTER; J. F. Williams, Springfield, Mo. App. filed March 6, 1924.

1,549,652. FUSE MECHANISM; L. N. Crichton, Wilkinsburg, Pa. App. filed Oct. 11, 1922. Used in high-tension circuits for protecting transformers and other equipment.

1,549,658. ELECTRICAL ALTERNATING-CURRENT RELAY; O. Ellefsen, Burnside, Glasgow, Scotland. App. filed Aug. 26, 1921. For use in switch control systems.

1,549,664. METHOD AND MEANS FOR MEASURING FREQUENCY; P. MacGahan, Pittsburgh, Pa. App. filed Nov. 16, 1918.

1,549,667. CIRCUIT CONTACT; L. P. Hutt and Peter Mole, Jr., Schenectady, N. Y. App. filed June 7, 1922. For the electrodes of arc lights.

1,549,679. ELECTRIC SWITCHING APPARATUS; L. C. Nicholson, Eden, N. Y. App. filed Sept. 19, 1921. Quick-break air switch for high-tension circuits.

1,549,684. ALTERNATING-CURRENT MOTOR; F. Punga, Mulheim-Ruhr-Speldorf, Germany. App. filed Aug. 16, 1920. With double wound rotor.

1,549,690. TROLLEY-CONDUCTOR HOLDER; H. Schutte, Swissvale, Pa. App. filed Dec. 29, 1923.

1,549,693. CLAMP FOR TROLLEY CONDUCTORS; P. G. Swars, Pittsburgh, Pa. App. filed Dec. 7, 1923.

1,549,698. MOTOR-CONTROL SYSTEM; H. W. Williams, Wilkinsburg, Pa. App. filed Sept. 8, 1923. For elevators, machine tools and similar machines.

1,549,704. BATTERY-CHARGING SYSTEM; C. T. Allcutt, Pittsburgh Pa. App. filed Dec. 17, 1919. Wherein the charging rate is relatively high as compared with the load current derived therefrom.

1,549,706. CONTROL APPARATUS; L. M. Aspinwall, Pittsburgh, Pa. App. filed Jan. 20, 1921. Electropneumatic switch employed for opening and closing circuits.

1,549,709. LOAD-LIMITING DEVICE FOR AUTO SUBSTATIONS; C. A. Butcher, Wilkinsburg, Pa. App. filed Oct. 9, 1920.

1,549,716. ELECTRIC GAS LAMP WITH GLOW DISCHARGE; F. Skaupy and A. Fehse, Berlin, and G. Gaidies, Berlin-Pankow, Germany. App. filed June 6, 1921.

1,549,734. RELAY; P. MacGahan, Pittsburgh, Pa. App. filed April 7, 1920. For tripping circuit interrupters.

(Issued August 18, 1925)

1,549,737. SIGNALING SYSTEM; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Sept. 15, 1919. For receiving and detecting high-frequency signals.

1,549,756. MOTOR-VENTILATING DEVICE; C. C. Farmer, Pittsburgh, Pa. App. filed April 15, 1922.

1,549,773. HOLDER FOR ELECTRIC HEATER COILS; L. P. Hynes, Albany, N. Y. App. filed April 8, 1924.

1,549,816. PROGRAM TRANSMISSION OVER WIRES; J. F. Toomey, New York. App. filed Nov. 11, 1922.

1,549,817. TROUBLE-INDICATING ARRANGEMENT; J. F. Toomey, New York, N. Y. App. filed July 12, 1924. For indicating abnormal circuit conditions.

1,549,820. PRINTING TELEGRAPH; G. S. Vernam, Brooklyn, N. Y. App. filed Jan. 12, 1922.

1,549,821. PRINTING TELEGRAPH SYSTEM; G. S. Vernam, Brooklyn, N. Y. App. filed Sept. 14, 1923.

1,549,849. VOICE-FREQUENCY CARRIER TELEGRAPH; H. A. Affel, Brooklyn, N. Y. App. filed Nov. 14, 1922.

1,549,872. ELECTRIC WELDING APPARATUS; E. S. Hebeler, Williamsville, and S. C. Schulenberg, Forks, N. Y. App. filed Sept. 19, 1921. Arc welding.

1,549,874 ELECTRIC ARC WELDING AND CUTTING SYSTEM AND APPARATUS THEREFOR; C. J. Holslag, South Orange, N. J. App. filed Dec. 9, 1921.

1,549,905. EXTENSION FOR ELECTRIC LIGHT SOCKETS; C. A. Church, Peterboro, Ontario, Canada. App. filed Aug. 27, 1924.

1,549,907. TELEGRAPHY; A. A. Clokey, Rutherford, N. J. App. filed Nov. 11, 1920. Equipment for transmitting telegraphic signals over signaling conductors possessing high electrostatic capacity.

1,549,914. SOLDERING IRON; W. E. Guest, Chicago, Ill. App. filed April 26, 1924.

1,549,921. CONTROLLER FOR ELECTRIC MOTORS; F. H. Oberschmidt, Cleveland, Ohio. App. filed Sept. 28, 1922.

1,549,948. SUBMARINE CABLE; J. J. Zelenka, Chicago, Ill. App. filed April 21, 1921.

1,549,953. IGNITION MAGNETO; F. W. Andrew, Brooklyn, N. Y. App. filed Oct. 3, 1921.

1,549,984. TRAINMAN'S SAFETY CIRCUIT; L. P. Hynes, Albany, N. Y. App. filed Nov. 25, 1924.

1,550,005. AUTOMATIC ELECTRIC IGNITER; F. R. Belkin, Brooklyn, N. Y. App. filed March 26, 1924. For igniting the combustible mixture in gas or liquid burners.

1,550,023. METHOD OF AND MEANS FOR SEPARATING DESIRED FROM UNDESIRED ELECTRIC CURRENTS; E. G. Gage, Brooklyn, N. Y. App. filed April 20, 1921.

1,550,031. SAFETY SWITCH; F. T. Kovar and J. F. Jirka, Cleveland, Ohio. App. filed Sept. 12, 1921. High capacity.

1,550,036. COLORED-LIGHT DISPLAY APPARATUS; L. C. McCann, San Francisco, Cal. App. filed Feb. 25, 1924.

1,550,048. APPARATUS FOR RECORDING ELECTRICAL SIGNALS; S. Ruben, New York, N. Y. App. filed June 17, 1922. For translating radio and telegraphic signals into permanent, visible impressions upon a fluid-absorbing surface.

1,550,063. AUTOMATIC CONTROL FOR ELECTRIC HEATERS, COOKERS OR THE LIKE; W. C. Donaldson, Ottawa, Ontario, Canada. App. filed Nov. 21, 1923.

1,550,073. RAIL BOND; J. P. Holsing, High Splint, Ky. App. filed Nov. 14, 1923.

1,550,098. DOOR BUZZER; I. B. Sanders, Fort Worth, Tex. App. filed March 15, 1923.

1,550,100. LAMP AND HEATER; J. S. Scharf, New York, N. Y. App. filed Oct. 25, 1923. May be used for heating and cooking.

1,550,147. MOTOR STARTING; W. C. Broekhuysen, New Haven, Conn. App. filed Nov. 20, 1923. For single-phase motors.

1,550,155. THERMALLY CONTROLLED APPARATUS; A. S. FitzGerald, London, England. App. filed May 17, 1923.

1,550,164. ELECTRICALLY HEATED STEAM BOILER; J. Heinrich, Berlin, Germany. App. filed Oct. 27, 1922.

1,550,165. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Aug. 10, 1921. Oil type.

1,550,166. ELECTRIC GENERATING APPARATUS; H. M. Hobart, Schenectady, N. Y. App. filed March 17, 1922. Direct current.

1,550,167. TROLLEY WHEEL; H. Hollard, Cleveland, Ohio. App. filed Aug. 21, 1922.

1,550,179. AMPERE-HOUR METER; F. S. Marcellus, Amsterdam, N. Y. App. filed Oct. 9, 1923.

1,550,180. ELECTROMAGNETIC OPERATING MECHANISM; C. L. Perry, Schenectady, N. Y. App. filed Jan. 22, 1921. Electric switch.

1,550,185. HEATING PLATE; C. Steenstrup, Schenectady, N. Y. App. filed Dec. 20, 1923. As used in an hydraulic press.

1,550,186. SYSTEM OF ELECTRIC MOTOR CONTROL; E. B. Tuppen, Birmingham, England. App. filed Jan. 16, 1924.

1,550,197. RADIATION PROJECTOR; E. R. Berry, Malden, Mass. App. filed June 6, 1923. Utilizes the light-conducting properties of quartz.

1,550,199. POWER-LINE TAPPER; G. W. Bower, Schenectady, N. Y. App. filed July 9, 1923.

1,550,203. MERCURY-VAPOR APPARATUS; W. Burstyn, Berlin-Wilmersdorf, Germany. App. filed May 28, 1923.

1,550,206. VARIABLE-RESISTANCE CONDUCTOR TERMINAL; F. P. Church, Lynn, Mass. App. filed May 1, 1922.

1,550,209. ELECTRIC CIRCUIT BREAKER AND THE LIKE; H. W. Clothier, Wallsend-on-Tyne, and B. H. Leeson, Tynemouth, England. App. filed March 11, 1924. Suitable for use on traction or other systems where short circuits are likely to occur.

1,550,215. PROTECTIVE DEVICE FOR ALTERNATING-CURRENT ELECTRIC SYSTEMS; A. E. McColl, Dumbarton, Scotland. App. filed Oct. 25, 1919.

1,550,224. ELECTRIC BOILER; A. N. Otis and E. H. Horstkotte, Schenectady, N. Y. App. filed Dec. 27, 1924.

1,550,229. ELECTRODE HOLDER; C. H. Stoody, S. M. Stoody and W. F. Stoody, Whittier, Cal. App. filed July 19, 1924.

1,550,235. INDUCTION MOTOR; E. C. Ballman, St. Louis, Mo. App. filed Jan. 19, 1920. Starting circuit.

1,550,240. ELECTRICAL MEASURING INSTRUMENT; R. C. Browne, Salem, Mass. App. filed Oct. 10, 1921.

1,550,251. PHASE-REGULATING DEVICE; W. Hahnemann, Kitzeberg, near Kiel, and W. R. and H. Hecht, Kiel, Germany. App. filed Aug. 23, 1921.

1,550,258. MAST ARM; N. C. Husted, Niles, Ohio. App. filed Sept. 9, 1924. For supporting a lighting fixture.

Financial and Corporate

Utility Market Irregular

Trading Continues Generally Dull, but Increased Strength Appears in Certain Groups

AS IS usually the case just previous to a holiday, trading last week turned relatively dull and fluctuations became comparatively unimportant. Earlier in the week the losses outnumbered the gains, and recession was noted at a time when the listed issues of the industrial and railroad groups also were inclined to be weak. Rallies in the general market, however, had a favorable influence upon utilities, and in addition there was the stimulus that came with the announcement that the Western Power Corporation was about to be taken into the North American Company group.

Easily the outstanding feature of the week was the strength that came to the Western Power Corporation shares as a result of this merger rumor, and at the close of the week the common shares were up five and the preferred shares up seven points. Considerable activity developed in United Light & Power, and the common stock of that utility stood eight points above its close of the week before at the time when the records were compared for this review.

Commonwealth Power Corporation's new stock deserves special mention both for its period of weakness and strength. The common shares had lost ground earlier in the week, declining to a new low level around 32, but afterward rallied smartly and closed the week up three points.

Buffalo General Electric in losing eight points made the sharpest decline of the week, but a loss of that magnitude is not especially significant in the circumstances, for the issue is not actively dealt in. Electric Bond & Share improved its position by three points, but losses were suffered by American Light & Traction, Carolina Power & Light, Georgia Light, Power & Railway and Northern Ontario Power.

New Capital Issues

Public offering was made on Wednesday of a new issue of 7 per cent cumulative preferred stock of the Pennsylvania Gas & Electric Company, the shares being priced at 98½ and accrued dividends to yield 7.10 per cent. The company supplies with gas service York, Pa., and the adjoining boroughs of West York and North York, and through a subsidiary about to be acquired will furnish electric light and power, gas and street railway service in Moncton, New Brunswick.

The Shenandoah River Power Company which was recently incorporated in Virginia to take over the independent electric light and power companies operating in the Shenandoah Valley, has made an offering of its first mortgage gold bonds to the amount of $410,000 at 97 and interest to yield about 6.35 per cent.

The General Power & Light Company was also represented with an issue of one-year mortgage lien 6 per cent gold notes totaling $900,000. These notes were priced at 100 and interest to yield 6 per cent. The proceeds will pay in part for the acquisition of properties and securities pledged under this issue.

Bonds Called in September

Among the bonds called for payment in September in advance of maturity were the following electrical securities:

Issues	Amount	Date
General Electric 5's, 1952	$15,136,500	Sept. 1
Standard Gas & Elec. 6½'s, 1954	5,213,200	Sept. 1
General Gas & Elec. 7's A, 1952	2,020,000	Sept. 1
General Gas & Elec. 6's, 1935	1,549,150	Sept. 1
Puget Sound Pwr. & Lt. 8's, 1926	850,000	Sept. 1
North Missouri Power 7's, 1926	300,000	Sept. 1
Indiana Utilities 6's, 1932	196,400	Sept. 1
Middle West Utilities 8's, 1935	2,335,100	Sept. 2
Wisconsin Utilities 6's, 1929	1,000,000	Sept. 18

Puget Sound Power & Light's Expansion

Transmission System Extends from Canadian Border Across State of Washington—Successful Refunding Undertaking in 1924—Wide Distribution of Stock

BY PAUL WILLARD GARRETT

NO MORE significant piece of financing of the kind was undertaken last year by any company than the Puget Sound Power & Light Company's refunding of a large issue—$13,446,000—of general and refunding 7½ per cent bonds due in 1941 by an issue of long-term bonds bearing only a 5½ per cent coupon. It meant that the Puget Sound company was able, notwithstanding the depression that the Northwest had suffered in the last two or three years, to replace a relatively dear with a relatively cheap loan.

Any one who looks at a chart of Puget Sound Power & Light earnings

TRANSMISSION SYSTEM OF PUGET SOUND POWER & LIGHT COMPANY

over a period of years is likely to wonder why 1924's balance available for reserves and retirements should have been smaller than those reported for any year since the war, although the company's gross earnings were the largest in its history. Explanation is to be found, not in the fact that the company is operating less efficiently, but rather that charges were made against capital on which the company has not yet had an opportunity to show benefits in its annual report. Additions and improvements to the company's physical equipment and new properties bought amounted to more than $6,000,000 after allowing for retirements.

With total assets of $112,071,887 and a property and plant account alone of $85,242,885, the Puget Sound Power & Light Company takes rank among the country's larger utilities. Gross earnings in 1924 totaled $12,539,868, the light and power department contributing $7,663,337 of the total and the transportation department $3,676,337. That the company has had success in securing a wide distribution of its stock at home is illustrated by the fact that the number of resident stockholders in the State of Washington was increased from only 250 in 1922 to 2,825 by the end of 1924.

On the differences in the financing of a public utility and an industrial concern, about which misapprehension exists in some quarters, the company has the following to say: "An electric company differs from a mercantile company in that it requires a much greater investment in plant and equipment for the same annual gross revenue. Regulation of its rates limits the net earnings to a fair return on the value of the plant investment. It becomes evident from these facts that new capital is constantly required in order to keep pace with the increased demand for service and to provide the necessary extensions and improvements."

American Gas Merger Approved.—Merger of the American Gas Company with the United Gas Improvement Company has been authorized by the Pennsylvania Public Service Commission and by Governor Pinchot. Stockholders of both companies had previously approved the plan, details of which were published in the March 21, 1925, issue of the ELECTRICAL WORLD.

Annual Report of Mexican Light & Power Company.—The gross earnings of the Mexican Light & Power Company, Ltd., for the year ended December 31, 1924, amounted to $15,864,260, Mexican currency, as compared with $14,827,943 during 1923. Net earnings, after allowing for taxes and depreciation, amounted to $7,941,787 as compared with $8,309,162 in 1923. During the year new, completed and uncompleted construction work called for an expenditure of $1,391,305. In 1924 there was generated at all the company's power houses 523,595,300 kw.-hr. of electrical energy against 477,062,315 kw.-hr. in the preceding year. During the year consumers' accounts advanced from 91,076 to 108,613, an increase of 17,537 as compared with the year's increase in 1923 of 17,261.

Europe's Largest Producer of Energy

Electric Power Corporation of Germany, Which This Year Has Done Some Financing in the United States, Has Enjoyed a Growth of Striking Proportions

THE year 1925 has so far been an important one in the financing of the power and light companies of this nation, but investors in this country have likewise been called upon more than ever before to invest in the bonds of foreign utilities. Since the turn of the year no less an amount than $109,500,000 in foreign electrical securities has been marketed in the United States.

One of the companies that entered this market for funds was the Electric Power Corporation (Elektrowerke Aktien Gesellschaft) Germany, the largest producer of electric power in Europe and which, in fact, deserves rank among the largest producers in the world. During 1924 its plants, two of which are located in the lignite fields of Germany, produced 1,410,210,000 kw.-hr., an output that in 1923 was exceeded by only six American companies, that is, by the Niagara Falls Power Company, Commonwealth Edison Company of Chicago, New York Edison Company, Pacific Gas & Electric Company, Southern California Edison Company and Detroit Edison Company. The territory in which the Electric Power Corporation wholesales power has a population of 16,000,000 and covers the most important industrial sections of Germany, including the cities of Berlin, Leipzig, Dresden, Magdeburg, Chemnitz, Spandau and Dessau. The stations at Zschornewitz (Golpa) and Trattendorf are famous outside of Germany and are the models cited in the Giant Power Survey of Governor Pinchot.

The Electric Power Corporation attained its importance in 1921 when various companies were merged into the present system. Its entire outstanding capital stock is held by the United Industrial Corporation (Vereinigte Industrie-Unternehmungen Aktien Gesellschaft, or "Viag"). The Viag in turn is controlled by the German government. That the Electric Power Corporation has grown much after the manner of some of our own utilities must be clear to any one who has looked into the records. The electrical output of the company and its predecessors aggregated only 769,793,000 kw.-hr. in 1920. From that total it grew to 1,019,505,000 kw.-hr. in 1921, to 1,311,774,000 kw.-hr. in 1922, fell slightly to 1,293,097,000 kw.-hr. in 1923 and rose smartly to a new high of 1,410,210,000 kw.-hr. in 1924. Since 1920, in other words, the electrical output has increased by 83 per cent.

TRANSMISSION SYSTEM OF ELECTRIC POWER CORPORATION OF GERMANY

The capital structure is simple and conservative, even when judged by standards set up by some of the better companies in the United States. The first mortgage 6½ per cent bonds, due in 1950, that were offered to investors of this country and authorized to the amount of $25,000,000, but are outstanding at only $5,000,000, constitute the company's only funded indebtedness. Interest on the outstanding bonds is being earned between nine and ten times. Following the bonds is a $14,285,714 issue of capital stock. A present reproduction value of properties directly under the first mortgage amounts to more than six times the present funded debt, and a like valuation based on costs in this country would be substantially higher.

Listings.—The New York Stock Exchange has authorized the listing of $8,000,000 general and refunding mortgage 5 per cent gold bonds, series B, of the Detroit Edison Company, $12,000,000 first and refunding mortgage 5 per cent gold bonds, series A, of the New Orleans Public Service, Inc., and $5,000,000 of interim receipts of the same company exchangeable for permanent engraved first and refunding mortgage 5 per cent gold bonds, series

B, due June 1, 1955. There have been placed on the Boston Stock Exchange temporary certificates for 45,433 shares of 7 per cent cumulative preferred stock of the Central States Electric Corporation with authority to add 30,000 additional shares and temporary bonds of the Mississippi Power Company for $4,000,000 first and refunding mortgage gold bonds, 5 per cent series, due 1955. The board of governors of the Chicago Stock Exchange has listed 100,000 shares of class A preferred stock of the Midland Utilities Company.

Ingersoll-Rand to Reclassify Common Stock.—Stockholders of the Ingersoll-Rand Company will vote October 6 on changing the authorized common stock from 300,000 shares, par $100, to 1,500,000 shares of no par value.

Southern California Edison Stock Sales During 1925.—Selling $16,423,200 of company stock to 7,816 stockholders during the first seven months of 1925 is the enviable record established by the Southern California Edison Company in its efforts to advance the customer-ownership idea. During the corresponding period of 1924 $12,924,900 worth of stock was sold to 4,563 stockholders. The 1925 period thus shows an increase in money received of 27.07 per cent and a 71.29 per cent increase in the number of stockholders secured. Early in 1917 the customer ownership campaign was launched by the company. At that time there were 2,207 stockholders. On July 31, 1925, there were 78,053, showing an average yearly increase in stockholders of 9,480. Dividends to the amount of $31,388,280 had been distributed to the stockholders up to July 31, 1925.

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Water Works & Elec., com.	5*	Sept. 30
Bangor Hydro Electric, pf.	1¾	Oct. 1
Brazilian Trac., Lt. & Pwr., pf.	1¾	Oct. 1
Central States Electric, pf.	1¾	Oct. 1
Continental Gas & Elec., com.	$1.10	Oct. 1
Continental Gas & Elec., pr. pf.	1¾	Oct. 1
Continental Gas & Elec., ptc. pf.	1¾	Oct. 1
Continental Gas & Elec., ptc. pf. (extra)	¾	Oct. 1
Continental Gas & Elec., pf.	1¾	Oct. 1
Manufacturers Light & Heat	2	Oct. 12
Pennsylvania Power & Light, pf.	$1.75	Oct. 1
Power Corp. of New York, com.	.25	Oct. 1
Power Corp. of New York, pf.	1¾	Nov. 1
Public Service Electric & Gas., 6% pf	1½	Sept. 30
Southern Canada Power, pf.	1½	Oct. 15
Springfield Railway & Light, pf.	1¾	Oct. 1
United Gas & Electric, pf.	1¾	Oct. 1
United Lt. & Pwr., com., A and B	.60	Nov. 2
United Lt. & Pwr., com., A and B†	....	Nov. 2
United Lt. & Pwr., com., A and B extra‡	....	Nov. 2
West Penn Power, 7% pf.	1¾	Nov. 2
Winnipeg Electric, pf.	1¾	Oct. 1
Allis-Chalmers Mfg. Co., pf.	1¾	Oct. 15
Emerson Electric Mfg., pf.	1¾	Oct. 1
Manhattan Electrical Supply	$1.12½	Oct. 1
Weston Electric Instrument, cl. A	.50	Oct. 1
Westinghouse Elec. & Mfg., com.	$1	Oct. 31
Westinghouse Elec. & Mfg., pf.	$1	Oct. 15

*Payable in common stock. †Semi-annual. One-fortieth share class A common. ‡One-fortieth share class A common.

Associated Gas & Electric Makes Offering to Bondholders.—In connection with the offering of 6½ per cent interest-bearing option warrants which is being made by the Associated Gas & Electric Company to stockholders and bondholders the announcement has been made that the 6½ per cent secured convertible gold bonds, due 1954, will be accepted in payment for the option warrants on the basis of a one-thousand-dollar bond for thirty option warrants, $35 paid. This is equal to 105 (call price of the bonds) flat.

Bond Conversion Proposed.—Holders of the 5 per cent first mortgage fifty-year gold bonds of the Alabama Traction, Light & Power Company, Ltd., will vote October 7 on accepting an offer made by the Southeastern Power & Light Company for the exchange or conversion of the bonds into 6 per cent gold debentures, series A, of the Southeastern Power & Light Company, due 2025, together with warrants entitling the holders to purchase shares of common stock of the Southeastern company. The bondholders are also asked to approve the release of the mortgaged premises and the release and discharge of the company and of the Southeastern Power & Light Company, as having assumed the same, from the whole of the principal and interest owing upon the bonds and from all obligations under the deed of trust.

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of July:

Name of Company	Gross Earnings for July 1925	Gross Earnings for July 1924
Am. Wtr. Wks. & Elec., Inc	$3,233,680	$2,940,528
Asheville Power & Light	100,860	86,890
Barcelona Trac., Lt. & Pwr.	6,539,975	5,925,807
Brazilian Trac., Lt. & Pwr.	2,560,132	1,730,572
Carolina Power & Light	234,203	183,078
Eastern Shore Gas & Elec.	72,662	51,986
Federal Light & Traction	434,600	414,853
Georgia Railway & Power	1,225,554	1,332,764
Grafton County Electric Light & Power	16,605	14,669
New England Co. Power System	635,541	491,245
Penn Central Light & Power	323,786	284,508
West Penn	1,961,441	1,897,053
Winnipeg Electric	396,569	385,473
Yadkin River Power	128,599	126,430

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated or preference value of stock is $100.)

Companies	Bid Price Saturday, Sept. 5	Low 1925	High 1925
STOCKS			
Abitibi Pwr. & Paper, com.—no par	h 65	62	75¼
Adirondack Pwr. & Lt.—7% pf.	100	98	106
Adirondack Pwr. & Lt.—8% pf.	108	103	115
Adirondack Pwr. & Lt., com.—50	70	31	98
Ala. Pwr., pf.	h102	....	....
Allis-Chalmers Mfg. pf.	108	103½	108
Allis-Chalmers Mfg., com	h 88¼	71¼	89¼
Amer. & Foreign Pwr., pf. 25% pd.	130	114¼	135
Amer. & Foreign Pwr., 7% pf.	h 91	87	94
Amer. & Foreign Pwr., com.	h 41¼	27¼	47
Amer. Bosch Magneto, com.—no par	h 31¼	26¼	54¼
Amer. Elec. Pwr., pf.	c 103	96	104½
Amer. Gas & Elec., 6% pf.—no par	90	85	91
Amer. Gas & Elec., com.—no par	75	70	85
Amer. Lt. & Trac., 6% pf.	100	93	101½
Amer. Lt. & Trac., com	206	139	220
Amer. Pwr. & Lt., 6% pf.	93	84	91¼
Amer. Pwr. & Lt., com.—no par	54	52	67
Amer. Pub. Serv., 7% pf.	91	88	94
Amer. Pub. Serv., com.	85	45	90
Amer. Pub. Utilities, 4% pf.	80	....	....
Amer. Pub. Utilities, 5% pf.	c 75	71	82
Amer. Pub. Utilities, 6% pf.	75	71	82
Amer. Pub. Utilities, 7% pf.	88	87	95
Amer. Pub. Utilities, com.	95	70	103
Amer. Superpwr., pf.—25	c 26¼	24½	26¼
Amer. Superpwr., Class A—no par	35	26½	39½
Amer. Superpwr., Class B—no par	37½	27¼	41
Amer. Wtr. Wks. & Elec., 6% pf.	c 104	95½	110½
Amer. Wtr. Wks. & Elec., 7% pf.	98¼	97½	103
Amer. Wtr. Wks. & Elec., com.	h62¼	34¼	68¼
Appalachian Pwr., 7% pf.	98	92	100
Appalachian Pwr., 1st pf., 7%	100	95	101
Appalachian Pwr., com.—no par	78	70	83
Arizona Pwr., 7% pf.	78	75	87
Arizona Pwr., com.	25	15	33
Arkansas Lt. & Pwr., 7% pf.	99	92	102
Arkansas Lt. & Pwr., com.	100	65	101
Asheville Pwr. & Lt., 7% pf.	h101	101	102½
Assoc. Gas & Elec., 7% pf.—1% extra—50	h 40½	....	....
Assoc. Gas & Elec., pf.—$6—no par	h 55	....	....
Assoc. Gas & Elec., Class A	h 39	....	....
Babcock & Wilcox, com.	144	....	....
Blackstone Valley Gas & Elec., com.—50	37	....	....
Brazilian Trac., Lt. & Pwr., com.	f74½	....	....
Broad River Pwr., pf.	92	90	97
Brooklyn Edison, com.	h138	120½	140½
Buffalo Gen. Elec., com.	65	44	73½
Carolina Pwr. & Lt., pf.—$7—no par	103	100	107
Carolina Pwr. & Lt., com.	390	290	430
Central Ariz. Lt. & Pwr., pf.	100	100	106
Central Ark. Ry. & Lt., 7% pf.	97	91	98½
Central Ill. Pub. Serv., 6% pf.	85	84	93
Central Ind. Pwr., 7% pf.	89	88	95
Central Pwr. & Lt., pf.	93½	88	95
Central States Elec., 7% pf.	96	87	98
Central States Elec., com.	170	70	180
Cincinnati Gas & Elec., com.	g 88¼	82	90
Cities Service, 6% pf.	83	80	84
Cities Service, pf. B—10	h 7¼	....	....
Cities Service, pf. BB—100	....	....	....
Cities Service, com.	38½	34	43
Cities Service, Bks. Shrs.	19	16½	22
Cleveland Elec. Illg., 6% pf.	102	101	105
Cleveland Elec. Illg., com.	240	200	250
Colorado Pwr., 7% pf.	95	93	98
Columbia Gas & Elec., 7% pf.	109½	104½	1 0½
Columbia Gas & Elec., com.—no par	h 73½	45½	5½
Columbia Ry., Gas & Elec., 6% pf.	90	90	90
Columbus Elec. & Pwr., 2d pf.	h101	....	....
Columbus Elec. & Pwr., com.	h153	....	....
Columbus Ry., Pwr. & Lt., pf. A	93	86	99
Columbus Ry., Pwr. & Lt., pf. B	83	80	85
Columbus Ry., Pwr. & Lt., com.	150	114	150
Commonwealth Edison, com.	a136	130½	141½
Commonwealth Pwr., 6% pf.	82	80	85½
Commonwealth Pwr., com—no par	120	106	173
Conn. Lt. & Pwr., 8% pf.	115	115	118
Conn. Lt. & Pwr., 7% pf.	106	105	110
Cons. Gas of N. Y., pf.	h 56½	....	....
Cons. Gas of N. Y., com—no par	h 88¼	74½	92½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	c104	102	104
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	c110½	105	110½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	109	108	112
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	124	123	126
Cons. Gas, Elec. Lt. & Pwr. of Balti., com.—no par	44	32	45
Cons. Utilities of Dela., 7% pf.	85	80	84
Consumers Pwr., 6% pf.	95	90	97
Consumers Pwr., 6.6% pf.	98	97	102
Continental Gas & Elec., 7% ptc. pf	91	85	97
Continental Gas & Elec., 7% pr. pf.	95½	89	95
Continental Gas & Elec., com.	135	77	145
Dayton Pwr. & Lt., 6% pf.	93	88	100
Dayton Pwr. & Lt., com.	400	180	460
Detroit Edison, com.	130	110	134½
Dubilier Condenser & Radio, com.	h 18½	....	....
Dubuque Elec., 7% pf.	90	80	90
Duquesne Lt., 7% pf.	109	104	112
East. Tex. Elec., 7% pf.	100	100	105
East. Tex. Elec., com.	68	70	75½
Edison Elec. Illum. of Boston, com.	d202½	200	213
El Paso Elec., com.	h 74	....	....
El Paso Elec., pf.	h100	....	....
Elec. Bond & Share, 6% pf.	h104	104	105½
Elec. Bond & Share Sec., com.—no par	h 68½	66	69¼
Elec. Investors, 7% pf.	93	90	100
Elec. Investors, com.	57	30	66
Elec. Investors, 10% pd. receipts	37½	15	48½
Elec. Pwr. & Lt., ctfs, pf.	h 90½	89½	94
Elec. Pwr. & Lt., ctfs., 40% pd.	h105	100	110
Elec. Pwr. & Lt., ctfs., com.	h 32½	17½	40½
Elec. Storage Battery, com.—no par	h 65	60½	70½
Elmira Wtr., Lt. & R.R., 7% pf.	94	93	98
Empire Dist. Elec., 6% pf.	78	78	85
Engr. Pub. Serv., pf.	100	100	103
Engr. Pub. Serv., com.—no par	22	22½	30
Eureka Vacuum Cleaner, com.—no par	49	46	52½
Fairbanks Morse, com.	h 46	32½	49½
Federal Lt. & Trac., com.	h 28	26½	36
Federal Utilities, pf.	h 75	....	....
Federal Utilities, com.	h 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	h101½	101½	103
Galveston-Houston Elec., 6% pf.	68	70	75
Galveston-Houston Elec., com.—no par	20	32	40
Gen. Elec., com.	h314½	227½	337½
Gen. Elec., special—10	h 11½	11	11½
Gen. Gas & Elec., 6% pf.	220	72	240
Gen. Gas & Elec., 7% pf.	185	120	175
Gen. Gas & Elec., com.	210	72	240
Gen. Gas & Elec., pf.—$7—no par	140	90	175

Stock Exchange: cChicago; lSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati. hBid price, low and high, Tuesday, Sept. 8. tLatest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday, Sept. 5	Low 1925	High 1925
STOCKS—Continued			
Gen. Gas & Elec., (Me.) pf.—$8—no par	150	104½	180
Gen. Gas & Elec. (Del.) com. A no par	57½	42	64½
Gen. Gas & Elec. (Del.) com. B par	55	40	62
Gen. Gas & Elec. (Del.) A pf. 7% no par	97½	97½	100
Gen. Gas & Elec. (Del.) A pf. 8% no par	105	90	110
Gen. Gas & Elec. (Del.) B pf. 7% no par	94	88	96
Ga. Lt., Pwr., & Rys., 6% pf	80	74	85
Ga. Lt., Pwr. & Rys., com	65	25	74
Ga. Ry. & Elec., 5% pf	d 80½	78½	79½
Ga. Ry. & Elec., com	d118½	115½	115½
Ga. Ry. & Pwr., 8% pf	h112	....	....
Ga. Ry. & Pwr., 7% pf	h102½	....	....
Ga. Ry. & Pwr., 4% pf	104	62	110
Ga. Ry. & Pwr., com	105	62	118
Gt. Western Pwr., 7% pf	101	....	....
Havana Elec. Ry., Lt. & Pwr., com.	h226½	112	234
Hurley Machine, com.—no par	a 50	41½	56
Ill. No. Utilities, 6% pf	88	82	92
Ill. Pwr. & Lt., 7% pf	96	92½	98
Int. Combustion Engr., com.—no par	h 47½	31½	51
Int. Utilities, class A—no par	32½	31	46½
Int. Utilities, class B—no par	h 11	....	....
Interstate Pub. Serv., 7% pf	94	90	100
Iowa Ry. & Lt., 7% pf	97	92	100
Jersey Central Pwr. & Lt., 7% pf	96	90	96
Jersey Central Pwr. & Lt., com	45	15	50
Johns-Manville, com.—no par	h168	....	....
Kansas Gas & Elec., 7% pf	h100½	100½	101½
Kelvinator Corp., com.—no par	h 41½	....	....
Kentucky Hydro-Elec., com	f 92½	85½	92½
Kentucky Sec., 6% pf	67	67	78
Kentucky Sec., com	78	77	87
Kentucky Utilities, 6% pf	90	82	95
Kings County Ltg., 7% pf	g100	....	....
Laclede Gas Lt., com	h161	110½	178
Lehigh Pwr. Sec., com.—no par	121	82	155
Long Island Ltg., 7% pf	103	100	105
Long Island Ltg., com	105	60	105
Los Angeles Gas & Elec., 6% pf	94	90	97
Manila Elec., com.—no par	h 40½	28½	49½
Maytag Mfg., com	h 21½	....	....
Metropolitan Edison, 6% pf	95	95	96
Middle West Utilities, 7% pf	96	90	100
Middle West Utilities, 7% pr. lien pf	104	98	108
Middle West Utilities, com.—no par	g106½	82½	125
Midland Utilities, pr. ln. pf	g101	98½	101
Milwaukee Elec. Ry. & Lt., 8% pf	100	98	105
Milwaukee Elec. Ry. & Lt., 7% pf	97½	96	105
Milwaukee Elec. Ry. & Lt., 6% pf	86½	83½	87
Minn. Pwr. & Lt., 7% pf	h100	100	101
Miss. Pwr. & Lt., pf	h100	....	....
Miss. River Pwr., 6% pf	90	87½	94
Miss. River Pwr., com	60	37	68
Montana Pwr., com	h 86½	64	99½
Montreal Pwr., com	f 208½	....	....
Mountain States Pwr., pf	h 93	....	....
MountainStates Pwr., com	h 27	....	....
National Elec. Pwr., com	62	40	65
National Lt., Ht. & Pwr., 5% pf	62	40	65
National Lt., Ht. & Pwr., com.—no par	11	11	....
National Pwr. & Lt., pf., $7—no par	98	95	99
National Pwr. & Lt., com.—no par	331	185	357
National Pub. Serv., 7% pf	h 95	....	....
National Pub. Serv., A com.—no par	h 25½	....	....
National Pub. Serv., B com.—no par	h 18	....	....
Nebraska Pwr., 7% pf	h101	101	102½
Nevada-Calif. Elec., com	h 31	32½	50½
N. J. Pwr. & Lt., 7% pf	105	92	102
New Orleans Pub. Serv., 7% pf	97	94	102
New Orleans Pub. Serv., com.—no par	30	31	38½
N. Y. Central Elec., 7% pf	100	96	101
Niagara Falls Pwr., 7% pf.—25	28½	27½	29
Niagara Falls Pwr., com.—no par	f 70	45½	77
Niagara, Lock. & Ont. Pwr., 7% pf	106	101½	110
Niagara, Lock. & Ont. Pwr., com.—no par	65	60	73
Niser Corp., A.—no par	h 60	....	....
Niser Corp., B.—no par	h 58½	....	....
No. Amer., 6% pf.—50	h 49½	46½	50½
No. Amer., com.—50	h 59½	41½	60½
No. Caro. Pub. Serv., pf.—$7—no par	91	90	96
No. N. Y. Utilities, 7% pf	h101	....	....
No. Ohio Pwr., com	10½	5	13½
No. Ohio Trac. & Lt., 6% pf	73	64	75
No. Ont. Lt. & Pwr., pf	75	68	78
No. Ont. Lt. & Pwr., com	47	41	52
No. States Pwr., 7% pf	100	95	100
No. States Pwr. com	112	103	125
No. Texas Elec., 6% pf	55	60	75
No. Texas Elec., com	40	40	70
No. West Utilities, pf	f 92½	90	95
Ohio Gas & Elec., 7% pf	90	87	100
Ohio Pwr., 6% pf	91	85	95
Ohio Pub. Serv., 7% pf	97	97	100
Oklahoma Gas & Elec., pf	h 94	....	....
Pacific Gas & Elec., 6% pf	95	92	99
Pacific Gas & Elec., com	h113½	102½	118½
Pacific Pwr. & Lt., 7% pf	h101	101	102½
Parr Shoals Pwr., 6% pf	90	90	100
Penn Central Lt. & Pwr., pf.—no par	c 70	60	70½
Penn-Ohio Elec., 7% pf	94	83½	96
Penn-Ohio Pwr. & Lt., 7% pf	92	91	100
Penn-Ohio Pwr. & Lt., 8% pf	103	101	110
Penn Pwr. & Lt.—$7—no par	h103½	103½	104½
Penn Pub. Serv., 7% pf	90	90	100
Penn Pub. Serv., 6% pf	80	80	90
Penn Wtr. & Pwr., com	162	120	178
Phila. Co., pf.—50	48½	45½	49
Phila. Co., com	h 59½	51½	62½
Phila. Elec., com	c 46	37½	49½
Pittsburgh Utilities, pf	h 14½	12½	17½
Portland Elec. Pwr., 7% pf	97	95	99
Portland Elec. Pwr., 6% pf	67	70	80
Portland Elec. Pwr., com	38	40	53
Portland Ry., Lt. & Pwr., pf	h 72	....	....
Portland Ry., Lt. & Pwr., com	h 41	....	....
Pwr. Corp. of N. Y., 7% pf	110	96	112
Pwr. Corp. of N. Y., com.—no par	78	15	89½
Pwr. Sec., pf	30	30	55
Pwr. Sec., com	15	8	30
Pub. Serv. of N. J., 7% pf	h103½	99	105
Pub. Serv. of N. J., 8% pf	115	108½	11 6
Pub. Serv. of N. J., com.—no par	h 80½	62½	87½
Pub. Serv. of No. Ill., 6% pf	108	90	97
Public Serv. of No. Ill., 7% pf	a108½	102	110½
Pub. Serv. of No. Ill., com.—no par	125	97	124
Pub. Serv. of Okla., 7% pf	94	87	95
Pub. Serv. Elec. & Gas, 6% pf	f 97½	92½	97½
Puget Sound Pwr. & Lt., 7% pf	102	102½	107
Puget Sound Pwr. & Lt., 6% pf	h 84½	....	....
Puget Sound Pwr. & Lt., com	53	49	61
Radio Corp. of Amer., pf.—50	48	48	54
Radio Corp. of Amer., com.—no par	h 57½	48½	77½
Republic Ry. & Lt., pf	80	70	85
Republic Ry. & Lt., com	64	49	65
Rochester Gas & Elec., 5% pf	105	80	98
Servel Corp., Class A	h 30	....	....
Sierra Pacific Elec., com	h 16½	....	....
Sioux City Gas & Elec., 7% pf	h 99	....	....
Southeastern Pwr. & Lt., 7% pf	97	90	100
Southeastern Pwr. & Lt., com	140	45	158
So. Calif. Edison, 8% pf	123	115	128
So. Calif. Edison, 7% pf	109	105	107½
So. Calif. Edison, 6% pf	95	90	95½
So. Calif. Edison, com	120	102	139
Southern Cities Utilities, 7% pf	82	77	100
Southern Cities Utilities, com	52	30	71
Southern Pwr. & Lt. of Md., pf	h107	....	....
Southern Pwr. & Lt. of Md., com	h 32	....	....
Southwestern Gas & Elec., pf	f 97½	92½	97½
Southwestern Pwr. & Lt., A	h 47	....	....
Southwestern Pwr. & Lt., B	h 22½	....	....
Southwestern Pwr. & Lt., 7% pf	98½	90	102
Springfield (Mo.) Ry. & Lt., 7% pf	92	92	93
Standard Gas & Elec., 8% pf	h 53	50½	55½
Standard Gas & Elec., 7% pf	99	96	100
Standard Gas & Elec., com.—no par	h 56½	40½	59½
Standard Pwr. & Lt., 7% pf	110	95	114½
Tampa Elec., com	h230	....	....
Tenn. Elec. Pwr., 6% pf	85	80	85
Tenn. Elec. Pwr., 7% pf	98	93	103
Tenn. Elec. Pwr., pf.—$6—no par	80	72	84
Tenn. Elec. Pwr., com.—no par	50	47	69
Tex. Pwr. & Lt., 7% pf	h102	102	104
Tide Water Pwr., 8% pf	h 98	....	....
Timken Roller Bearing, com	h 43½	37½	46½
Toledo Edison, 8% pf	110	109	114
Toledo Edison, 7% pf	100	94	101½
Toledo Edison, com	25	21	25
Tri-City Ry. & Lt., 6% pf	85	82	85
United Gas & Elec., 5% pf	91	80	94
United Gas & Elec., com.—no par	41	26	49
United Gas & Elec. (N. J.), 5% pf	62	55	65
United Gas Impr.—50	c 97	79½	100½
United Lt. & Pwr., pf.—$4—no par	50	41	51
United Lt. & Pwr., pf.—$6.50—no par	93	83	99
United Lt. & Pwr., com., A—no par	126	42	138
United Lt. & Pwr., com., B—no par	160	49	100
Utah Pwr. & Lt., 7% pf	h100½	100	101½
Utica Gas & Elec., 7% pf	102	100	104
Utica Gas & Elec., com	200	100	200
Utilities Pwr. & Lt., 7% pf., ctfs	h 99	....	....
Utilities Pwr. & Lt., com. B—no par	16	12	20
Vermont Hydro-Elec., 7% pf	90	87	96
Virginia Pwr., 7% pf	102	94	107
Virginia Pwr., com	65	65	92
Virginia Ry. & Pwr., com	h130	64½	135½
Wagner Elec., pf	b 88	79	91
Wagner Elec., com	b 37	26½	50
Washington Wtr. Pwr., com	129	110	140
West Mo. Pwr., 7% pf	h 91	....	....
West Penn., 7% pf	99	94	100
West Penn., com	h 99½	97	145
West Virginia Lt., Ht. & Pwr., 7% pf	94	94½	96½
West Va. Utilities, 7% pf.—50	38	38	47
Western Elec., 7% pf	h111½	110	117½
Western Pwr., 7% pf	97½	84	95½
Western Pwr., com.—no par	71	34	72½
Western States Gas & Elec., 7% pf	89	82	92
Western States Gas & Elec., com	h 19	....	....
Westinghouse Elec. & Mfg., com.—50	h 75½	66½	84
Weston Elec. Instrument, cl. A	h 27	19½	27
Weston Elec. Instrument, com	h 18½	9½	20½
Wis.-Minn. Lt. & Pwr., 7% pf	90	92	95
Wis. Pwr., Lt. & Ht., 7% pf	85	85	90
Worthington Pump, pf. A	76	77	88
Worthington Pump, pf. B	h 61	58	76½
Worthington Pump, com	h 38½	35½	79½
Yadkin River Pwr., 7% pf	h102	102	103½
Yale & Towne, com.—25	h 66	63	70½
BONDS			
Adir. Elec. Pwr. 5s 1962	99	97½	100½
Adir. Pwr. & Lt. 6s 1950	104½	102½	105½
Adir. Pwr. & Lt. 5s 1930	95	94	97½
Ala. Pwr. 5s 1946	98	96	100
Ala. Pwr. 5s 1951	9?½	92½	97½
Ala. Pwr. 6s 1951	104	101½	105
Ala. Trac. Lt. & Pwr. 5s 1962	100½	86	99½
Aluminum Co. of Amer. 7s 1933	107	106½	107½
Amer. Gas & Elec. 5s 2007	92½	90	93½
Amer. Gas & Elec. 6s 2014	97½	96½	98½
Amer. Pwr. & Lt. 6s 2016	96½	94	98
Amer. Pub. Serv. 6s 1942	98	94	99½
Amer. Wtr. Wks. & Elec. 5s 1934	96	92½	98
Anaconda Copper 6s 1929	h 103½	102½	104
Anaconda Copper 6s 1953	100½	99½	102
Anaconda Copper 7s 1938	101½	99½	104
Appalachian Pwr. 5s 1941	97½	96	99½
Appalachian Pwr. 6s 2024	91½	86½	94½
Appalachian Pwr. 7s 1936	105	105½	106½
Arizona Pwr. 6s 1933	99½	97½	101½
Arizona Pwr. 6s 1947	95	90	96
Ark. Central Pwr. 6s 1948	102	98½	102½
Ark. Lt. & Pwr. 6s 1945	101½	100	104½
Ark. Lt. & Pwr. 6s 1954	96½	92½	99½
Assoc. Gas & Elec. 6s 1965	92½	92	96
Assoc. Gas & Elec. 6½s 1954	103½	94½	106
Binghamton Lt., Ht. & Pwr. 5s 1946	97½	94½	98
Birmingham Elec. 6s 1954	101	99	103
Birmingham Ry., Lt., & Pwr. 4½s 1954	88	85	89½
Broad River Pwr. 6½s 1934	100½	99	102
Brooklyn Edison 5s 1949	101½	99½	103
Brooklyn Edison 6s 1930	105½	103½	106
Buffalo Gen. Elec. 1st 5s 1939	101½	100½	101½
Buffalo Gen. Elec. 1st & Ref. 5s 1939	100½	100	100½
Burlington Ry. & Lt. 5s 1932	94½	90	96
Butte Elec. & Pwr. 5s 1951	99½	99	100½
Calif. Gas & Elec. 5s 1937	100	98	101½
Canadian Lt. & Pwr. 5s 1949	40	36	62
Canton Elec. 5s 1937	99	99	100½
Carolina Pwr. & Lt. 5s 1938	99	98½	100½
Carolina Pwr. & Lt. 6s 1953	103½	103½	105
Cedar Rapids Mfg. & Pwr. 5s 1953	99½	98½	100½
Central Ark. Ry. & Lt. 5s 1928	98½	98½	100
Central Ga. Pwr. 5s 1938	95½	93	97
Central Ill. Lt. 5s 1943	97½	94	99½
Central Ill. Publ Serv. 5s 1952	88	84½	92½
Central Ill. Pub. Serv. 6s 1944	98	96½	101½
Central Ind. Pwr. 6s 1947	97½	95½	99½
Central Ia. Pwr. & Lt. 6s 1944	99	97	100½
Central N. Y. Gas & El. 5s 1941	95	94	97½
Central Pwr. & Lt. 6s 1946	101	97½	101½
Central Pwr. & Lt. 6½s 1952	100½	94	102
Central States Elec. 5s 1926	99	98	100½
Chattanooga Ry. & Lt. 5s 1956	84	81	85
Cincinnati Gas & Elec. 5s 1956	107½	98½	104½
Cincinnati Gas & Elec. 5½s 1967	103½	100½	105
Cities Service 6s 1966	90½	90½	91½
Cities Service 7s B 1966	f 176	150½	178½
Cities Service 7s C 1966	124½	111	128
Cities Service 7s D 1966	102½	98½	106½
Cities Service Pwr. & Lt. 6s 1944	93	93½	95
City Lt. & Trac. 5s 1952	84	74	85½
Cleveland Elec. Illum. 5s 1939	101½	100	102
Cleveland Elec. Illum. 5s 1954	100½	97½	101
Cleveland Elec. Illum. 7s 1941	110½	109	111½
Colorado Pwr. 5s 1953	95	93	96½
Columbia Gas & Elec. 5s 1927	99½	99½	100½
Columbia Ry., Gas & El. 5s 1936	92	92½	94½
Columbus, Dela. & Marion Elec. 5s 1937	85	83	88
Columbus, Dela. & Marion Elec. 6s 1937	95	91	98
Columbus Elec. & Pwr. 6s 1947	h102	....	....
Columbus Ry., Pwr. & Lt. 5s 1940	96½	93½	98
Columbus Ry., Pwr. & Lt. 6s 1941	102	101½	105
Commonwealth Edison 5s 1943	101½	99½	102½
Commonwealth Edison 5s 1953	99½	98½	101
Commonwealth Edison 5s 1954	99½	98	101
Commonwealth Pwr. 6s 1947	101½	97½	103½
Community Pwr. & Lt. 6s 1950	96	94½	98
Conn. Ry. & Ltg. 4½s 1951	90½	90	92½
Consol. Cities, Lt., Pwr. & Trac. 5s 1962	79½	75½	82½
Consol. Elec. 5s 1955	96½	94	98½
Consol. Gas of N. Y. 5½s 1945	103½	101½	105
Con. Gas, Elec. Lt. & Pwr. of Balti 4½s 1935	97	95½	97½
Con. Gas, Elec. Lt. & Pwr. of Balti 5½s 1952	f 104½	101½	105½
Con. Gas, Elec. Lt. & Pwr. of Balti 6s 1949	105½	104½	108
Con. Gas, Elec. Lt. & Pwr. of Balti 5s 1965	99½	98	100½
Consumers Elec. Lt. & Pwr. 5s 1936	95	93	96½
Consumers Pwr. 5s 1936	99½	99	100½
Consumers Pwr. 5s 1952	97	90½	100
Consumers Pwr. 5½s 1954	102	99	104½
Continental Gas & Elec. 5s 1927	99½	99½	100½
Continental Gas & Elec. 6s 1947	99½	98	101
Continental Gas & Elec. 6½s 1964	97½	96½	101
Continental Gas & Elec. 7s 1954	103	99	103½
Cumberland County Pwr. & Lt. 5s 1942	94	92	96½
Dallas Pwr. & Lt. 6s 1949	104	103	105½
Dayton Ltg. 5s 1937	99½	98½	100½
Dayton Pwr. & Lt. 5s 1941	99½	97	100½
Defiance Gas & Elec. 5s 1942	93	88½	97½
Denver Gas & Elec. 5s 1949	98	97½	100
Denver Gas & Elec. Lt. 5s 1951	93	92	95½
Des Moines Elec. 5s 1938	98	98	100½
Detroit Edison 5s 1933	107½	99½	102½
Detroit Edison 5s 1940	102½	99½	102½
Detroit Edison 5s 1949	99½	97	101½
Detroit Edison 5s 1955	99	97½	100
Detroit Edison 6s 1932	129	110½	133½
Detroit Edison 6s 1940	108	106½	108½
Detroit Edison 6s 1950	130	121½	133
Dominion Pwr. & Trans. 5s 1932	95	95½	98½
Dubuque Elec. 6s 1942	100½	97½	101½
Duke-Price Pwr. 6s 1949	100	98½	103
Duquesne Lt. 6s 1949	106	104½	107½
Duquesne Lt. 5½s 1949	105½	104	106
Durham Pub. Serv. 7s 1949	100	97½	101½
East Penn. Elec. 6s 1953	104	100½	105½
East Oregon Lt. & Pwr. 6s 1929	100	97½	100½
East. Tex. Elec. 5s 1942	h 96	....	....
Economy Lt. & Pwr. 5s 1956	98	96	99½
Edison Elec. Illum. of Bkln. 4s 1939	94	89	95½
Edison Elec. Illum. (N. Y.) 5s 1995	102½	99½	103
El Paso Elec. 5s 1932	h102	....	....
El Paso Elec. 5s 1950	h 95½	....	....
Elec. Pwr. Corp. (Germany) 6½s 1950	87	86½	88½
Emira Wtr., Lt. & R.R. 5s 1956	95	92½	96½
Empire Dist. Elec. 5s 1949	90	86½	91½
Erie Ltg. 5s 1967	98	95½	99½
Evansville Gas & Elec. Lt. 5s 1932	98½	96	100
Federal Lt. & Trac. 5s 1942	92½	88	96½
Federal Lt. & Trac. 6s 1942	101	96½	103
Federal Lt. & Trac. 6s 1954	92	91½	94½
Ft. Smith Lt. & Trac. 5s 1936	80½	76½	82½
Ft. Worth Pwr & Lt. 5s 1931	99	99	100½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati. hBid price, low and high, Tuesday, Sept. 8. (Latest quotations available.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies			Bid Price Saturday, Sept. 5	Low 1925	High 1925
BONDS (Continued)					
General Elec	3½s	1942	87	83	87
General Elec	5s	1952	f 107½	101½	107½
Georgia Carolina Pwr	5s	1952	87½	82	90
Ga. Lt., Pwr. & Rys	5s	1941	88	86½	90½
Ga. Ry. & Elec	5s	1932	98	98½	100½
Ga. Ry. & Elec	5s	1949	92½	88	94½
Ga. Ry. & Pwr	5s	1954	94½	89½	96
Ga. Ry. & Pwr	6s	1947	102	100½	103½
Ga. Ry. & Pwr	7s	1941	104½	105	107
German Gen Elec	7s	1945	93½	92	94½
Great Cons. Elec. Pwr. (Japan)	6½s	1950	86	86	86½
Great Cons. Elec. Pwr. (Japan)	7s	1944	89½	87½	91½
Great Falls Pwr	5s	1940	101½	99½	102½
Great Northern Pwr	5s	1935	98	96	99
Great Western Pwr	5s	1946	98½	95	99½
Great Western Pwr	5½s	1955	97½	96	99
Great Western Pwr	6s	1949	100½	100	102½
Great Western Pwr	6s	1952	101	99½	102½
Havana Elec. Ry., Lt. & Pwr	5s	1954	93½	85½	95½
Holtwood Pwr	6s	1954	103	100	104½
Houston Ltg. & Pwr	5s	1931	99½	98½	100
Houston Ltg. & Pwr	5s	1953	94	90½	95½
Houston Ltg. & Pwr	5½s	1954	100	97	101½
Hydraulic Pwr	5s	1951	100½	99½	102
Hydraulic Pwr	5s	1950	100½	100	103
Idaho Pwr	5s	1947	94½	93	97½
Ill. Elec. Pwr	6s	1943	102	99½	103½
Ill. Pwr.	5s	1933	93½	93	95½
Ill. Pwr. & Lt	6s	1953	100½	100½	102½
Ill. Pwr. & Lt	7s	1953	100½	99	102½
Ind. Elec	6s	1947	98	97	99½
Ind. Gen. Serv	5s	1948	95	92	97½
Ind. Lighting	4s	1958	80½	78	83
Indiana & Mich. Elec	5s	1957	96½	97½	99½
Ind. Pwr	7½s	1941	105½	104	106
Ind. Service	5s	1950	89½	86½	92
Ind. Service	6s	2020	86½	73	88½
Ingersoll-Rand	5s	1935	99½	92	99½
Interstate Elec	6s	1933	95	95	99½
Interstate Pwr	6s	1944	97	95	99½
Interstate Pwr	7s	1934	99½	97	100½
Interstate Pub. Serv	6s	1948	98	96	100½
Iowa Ry. & Lt	5s	1932	97½	97	99½
Jersey Cent. Pwr. & Lt.	5½s	1945	94½	95	98
Kansas City Pwr. & Lt.	5s	1952	99½	95½	101
Kansas Elec. Pwr	6s	1937	99½	97½	102
Kansas Elec. Pwr	6s	1943	99½	97½	102
Kansas Gas & Elec	6s	1952	99 ½	98½	103½
Kansas Gas & Elec	6s	2022	90	86½	94½
Kentucky Utilities	6s	1949	99	97	101½
Kings County Elec. Lt. & Pwr	5s	1937	102½	99	103
Kings County Elec. Lt. & Pwr	6s	1997	117½	114½	120½
Kings County Ltg	5s	1954	98½	89	101½
Kings County Ltg	6½s	1954	107½	103½	108½
Knoxville Ry. & Lt	5s	1946	92	88	95½
Laclede Gas Lt	5s	1934	101½	98½	101½
Laclede Gas Lt	5½s	1953	100½	95½	102
Laurentian Pwr	6s	1936	99	96	100
Laurentide Pwr	6s	1936	f 99	96	100
Laurentide Pwr	5s	1946	99½	97	100½
Lehigh Pwr. Sec	6s	1927	101	100½	101½
Lincoln Gas & Elec	5s	1941	90	92½	95½
Long Island Ltg	5s	1936	99	98½	100½
Long Island Ltg	6s	1945	100	99½	102
Long Island Ltg	6s	1948	103	102	105½
Los Angeles Gas & Elec	5s	1939	98	98	101½
Los Angeles Gas & Elec	5½s	1943	97½	94	99½
Los Angeles Gas & Elec	5½s	1947	97½	96	99½
Los Angeles Gas & Elec	5½s	1949	97	95½	99½
Los Angeles Gas & Elec	6s	1942	100	101½	104½
Louisiana Pwr	6s	1944	h96	....	....
Louisville Gas & Elec	5s	1952	96½	90½	99½
Louisville Gas & Elec	5½s	1954	101½	99	102
Lower Austrian Hydro-Elec	6½s	1944	85½	85½	86½
Luzerne County Gas & Elec	5s	1948	98	97	99½
Luzerne County Gas & Elec	7s	1944	103	99½	104½
Luzerne County Gas & Elec	6s	1954	101½	99	105
Madison River Pwr	5s	1935	99	99½	101
Manila Elec	7s	1942	100½	97½	102½
Manila Elec. Ry. & Ltg	5s	1953	90	85	92
Manitoba Pwr	7s	1941	103½	98½	105½
Memphis Pwr. & Lt	5s	1948	98½	95	99½
Metropolitan Edison	5s	1952	106	101½	106
Metropolitan Edison	5s	1953	94½	91½	97
Metropolitan Pwr	6s	1953	101	100	104
Michigan Lt	5s	1946	98	97½	100
Michican No. Pwr	5s	1941	96	95½	97
Milwaukee Elec. Ry. & Lt	5s	1926	100	100	101½
Milwaukee Elec. Ry. & Lt	4½s	1931	96½	94½	96½
Milwaukee Elec. Ry. & Lt	5s	1951	98	94	100
Milwaukee Elec. Ry. & Lt	5s	1961	89½	84½	92½
Milwaukee Elec. Ry. & Lt	6s	1953	100½	98½	104
Minn. Pwr. & Lt	6s	1950	103½	101½	105½
Miss. River Pwr	5s	1951	98½	96½	100½
Miss. River Pwr	7s	1935	103	102	104
Mobile Elec	5s	1946	96	91	97½
Montana Pwr	5s	1943	99½	97½	100½
Montgomery Lt. & Wtr. Pwr	5s	1943	93	86½	93½
Montreal Lt., Ht. & Pwr.	4½s	1932	97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933	98½	98½	101
Montreal Pub. Serv	5s	1942	93	89	94½
Mountain States Pwr	6s	1938	98	96½	100½
Nashville Ry. & Lt	5s	1953	97	94	98
Nashville Ry. & Lt	5s	1958	89	84	88½
Nassau Lt. & Pwr	5s	1927	98	98	101
Nassau & Suffolk Ltg	5s	1945	88	82	91
National Pwr. & Lt	7s	1972	101	97	103½
National Pub. Serv	6½s	1955	94	94	96½
Nebraska Pwr	5s	1940	99	97	99½
Nebraska Pwr	6s	2022	95½	89½	95½
Nevada-Calif. Elec	6s	1946	98½	96½	100½
Nevada-Calif. Elec	6s	1950	98½	96½	100½
New England Pwr	5s	1951	101	100½	103
New Jersey Pwr. & Lt	5s	1936	95	92½	97½
New Orleans Pub. Serv	4½s	1935	86½	83½	88½
New Orleans Pub. Serv	5s	1952	f 89	86½	94½
New Orleans Pub. Serv	5s	1955	f 89½	89½	93
New Orleans Pub. Serv	6s	1949	92	86½	93½
N. Y. & Queens Elec. Lt. & Pwr	5s	1930	100	99½	100½
N. Y. & Westchester Ltg	4s	2004	76	76	81
N. Y. & Westchester Ltg	5s	1954	94	93	95½
New York Edison	6½s	1941	113½	112	115½
New York Edison	5s	1944	100½	99½	102
N. Y. Gas & Elec. Lt., Ht. & Pwr	5s	1948	103½	100½	104½
N. Y. Gas & Elec. Lt., Ht. & Pwr	4s	1949	88½	86	90½
N. Y. State Gas & Elec	5½s	1962	99	96	101½
Newport News & Hampton Ry., Gas & Elec	5s	1944	91	84	93
Niagara Falls Pwr	5s	1932	101½	100	103
Niagara Falls Pwr	6s	1932	105½	103½	106½
Niagara Falls Pwr	6s	1950	104½	105½	106½
Niagara, Lock. & Ont. Pwr	5s	1954	98½	104½	110
Niagara, Lock. & Ont. Pwr	5s	1955	98½	97½	100
Niagara, Lock. & Ont. Pwr	6s	1958	f 109½	104½	110½
Norfolk Ry. & Lt	5s	1949	94	93	95½
No. Amer. Edison	6s	1952	101	96½	102½
No. Amer. Edison	6½s	1948	103½	100½	106
No. Amer. Lt. & Pwr	7s	1954	98½	97	100
North Caro. Pub. Serv	5s	1934	89	89	93½
North Caro. Pub. Serv	6s	1954	94	91½	96
North Caro Pub. Serv	6½s	1944	98	96	100
No. Calif. Pwr	5s	1948	99	98½	100½
No. Ind. Gas & Elec	5s	1929	99	97	100½
No. Ind. Gas & Elec	6s	1952	100	99½	103½
Northern N. Y. Utilities	5½s	1949	99	96½	100½
No. Ohio Trac. & Lt	4s	1933	85	82	87½
No. Ohio Trac. & Lt	5s	1956	81	78	87
No. Ohio Trac. & Lt	6s	1926	98	98½	100
No. Ohio Trac. & Lt	6s	1947	92	92	97
No. Ontario Lt. & Pwr	6s	1931	99	95½	99½
No. States Pwr	6s	1948	101½	101	104½
No. States Pwr	6s	1941	104½	103	107½
No. States Pwr	5s	1941	96½	93	99½
No. Tex. Elec	5s	1940	78	80½	82½
Northwestern Elec	6s	1935	101	101½	102½
Northwestern Pub. Serv	6½s	1948	99	97½	100½
Ohio Pwr	5s	1952	92	89½	96
Ohio Pwr	6s	1953	102½	101	104½
Ohio Pwr	6s	2024	92½	88½	95½
Ohio Pwr	7s	1951	106	106½	107½
Ohio Pub. Serv	5s	1954	90½	87	93
Ohio Pub. Serv	6s	1953	100½	98	101½
Ohio Pub. Serv	7½s	1946	111½	108	112½
Ohio Pub. Serv	7s	1947	109½	107½	111½
Ohio River Edison	6s	1948	102	98½	104
Okla. Gas & Elec	5s	1950	91½	93½	96
Okla. Gas & Elec	6s	1940	96	96	98½
Ontario Pwr. of Niagara Falls	5s	1943	99½	98	100½
Ontario Transmission	5s	1945	99½	97	99½
Ozark Pwr. & Wtr	5s	1952	78	75	81
Pacific Coast Pwr	5s	1940	98	97½	99½
Pacific Gas & Elec	5s	1942	96½	94	95½
Pacific Gas & Elec	5s	1955	93½	94	95½
Pacific Gas & Elec	6s	1941	105½	103½	106½
Pacific Gas & Elec	5½s	1952	100½	97½	102½
Pacific Lt. & Pwr	5s	1951	99	98½	100½
Pacific Lt. & Pwr	5s	1942	99½	98	101
Pacific Pwr. & Lt	5s	1930	98½	98	100
Pacific Pwr. & Lt	5s	1953	h96½	....	....
Parr Shoals Pwr	5s	1952	93	92½	97
Patterson & Passaic Gas & Elec	5s	1949	99	96	100½
Penn Central Lt. & Pwr	6s	1953	101½	102	104½
Penn Edison	5s	1946	95	94	97½
Penn Elec	6½s	1954	97	96	99½
Penn Ohio Elec	6½s	1938	102	99½	103½
Penn Ohio Pwr. & Lt	5½s	1954	97	95	99½
Penn Ohio Pwr. & Lt	6s	1939	97	94	99
Penn Pwr. & Lt	5s	1952	96½	95	98½
Penn Pwr. & Lt	5s	1953	96½	95	98½
Penn Pwr. & Lt	6s	1953	104½	102½	105½
Penn Pwr. & Lt	7s	1951	106	106	107½
Penn Pub. Serv	5s	1954	94½	93	96½
Penn Pub. Serv	6s	1947	102½	103	105½
Penn Wtr. & Pwr	5s	1940	100	99½	102
Penn Wtr. & Pwr	5½s	1953	101½	99½	103
Phila. Co	6s	1944	103½	101½	105
Phila. Co	5½s	1938	98½	93½	100
Phila. Co	5s	1951	95	95	97
Phila. Elec	5s	1966	102½	100	103½
Phila. Elec	5s	1960	100½	99	103½
Phila. Elec	5½s	1947	c105½	103½	107
Phila. Elec	5½s	1953	c105½	104½	107½
Portland Elec. Pwr	6s	1947	99	96½	100
Portland Gen. Elec	5s	1935	99½	98½	100½
Portland Ry., Lt. & Pwr.	5s	1942	88½	84½	92
Portland Ry., Lt. & Pwr.	6s	1947	99	94	100½
Portland Ry., Lt. & Pwr.	7½s	1946	107½	105½	107½
Potomac Edison	6s	1949	98	96	100
Potomac Edison	6½s	1948	101	99	103½
Potomac Elec. Pwr	5s	1929	100	99	100½
Potomac Elec. Pwr	5s	1936	99	98½	100
Power Corp. of N. Y.	6s	1942	99	97½	101
Power Corp. of N. Y.	6½s	1942	102	99½	103½
Power Securities	6s	1949	h82	....	....
Pub. Lt. & Pwr	5s	1945	74	64	79
Pub. Serv. Co. of Colo	5½s	1954	92	92	96½
Pub. Serv. Co. of Colo	6s	1953	99	98	101
Pub. Serv. Co. of Colo	7s	1933	99	98½	102½
Pub. Serv. Corp. of N. J.	5s	1959	104½	103½	105½
Pub. Serv. Corp. of N. J.	6s	1944	98½	95	99½
Pub. Serv. Co. of No. Ill.	5s	1956	96	91	97
Pub. Serv. Co. of No. Ill.	5½s	1962	100½	96½	102½
Pub. Serv. Co. of No. Ill.	5½s	1964	100½	96½	102½
Pub. Serv. Co. of Okla	6s	1949	98	97½	103
Pub. Serv. Elec. & Gas	5½s	1959	103½	98½	105½
Pub. Serv. Elec. & Gas	5½s	1964	103½	99½	105
Puget Sound Pwr	5s	1933	98	98½	100½
Puget Sound Pwr. & Lt	5½s	1949	98	96½	100½
Quebec Pwr	6s	1953	101	98½	102½
Queensborough Gas & Elec	5s	1952	99	96½	100½
Queensborough Gas & Elec	6s	1953	103	101	105
Rio de Janeiro Tram., Lt. & Pwr	5s	1935	f 89	85	91½
Robbins & Myers	7s	1952	63½	57½	73½
Rochester Gas & Elec	5½s	1948	102	102	104½
Rochester Gas & Elec	7s	1946	109	109½	111
Rockford Elec	5s	1939	99	98	101
Salt River Valley Wtr	6s	1938	h100	....	....
Salmon River Pwr	5s	1952	99½	98½	101½
San Antonio Gas & Elec	5s	1949	96	96	98
San Antonio Pub. Serv	6s	1952	f 101½	99½	104
San Diego Cons. Gas & Elec	5s	1939	98½	98	101
San Diego Cons. Gas & Elec	6s	1939	101½	99	103
San Joaquin Lt. & Pwr	5s	1945	98	98	100
San Joaquin Lt. & Pwr	6s	1950	101½	101	103½
San Joaquin Lt. & Pwr	6s	1952	101	99½	103½
San Joaquin Lt. & Pwr	6s	1954	100	99	101
Savannah Elec. & Pwr	7½s	1941	h104½	....	....
Saxon Pub. Wks. (Germany)	7s	1945	92½	90½	93½
Seattle Ltg	5s	1949	89	85½	92
Shawinigan Wtr. & Pwr	5s	1934	100	100	101½
Shawinigan Wtr. & Pwr	5½s	1950	102	101½	104
Shawinigan Wtr. & Pwr	6s	1950	104	104	106½
Siemens & Halske	7s	1928	97½	93½	99½
Siemens & Halske	7s	1935	92½	90½	96½
Sierra & San Francisco Pwr	5s	1949	76	75	80
Sierra & San Francisco Pwr	6s	1949	90	87	93½
Sioux City Gas & Elec	6s	1947	100	99	102
Sioux City Gas & Elec	6s	1949	100	99	102
So. Caro. Gas & Elec	6s	1942	87	87	93
So. Caro. Gas & Elec	6s	1932	75	83	88
So. Cal. Edison	5s	1939	99	99½	101
So. Cal. Edison	5s	1944	95	92½	96½
So. Cal. Edison	5½s	1944	101	98½	102
So. Cal. Edison	6s	1944	f 103½	102½	105½
So. Cal. Edison	6s	1943	103½	102½	105½
So. Cities Utilities	8s	1931	98	100	102
So. Public Utilities	5s	1943	97	97½	100½
So. Sierras Pwr	6s	1936	102	102	104½
So. Utilities	6s	1933	100	97½	102½
So. Wisconsin Pwr	5s	1938	89	88	93
Southwestern Gas & Elec	5s	1932	96½	94	98
Southwestern Gas & Elec	6s	1957	96	89	97½
Southwestern Pwr. & Lt.	5s	1943	92½	90	97
Southwestern Pwr. & Lt.	6s	2022	90	88½	94½
Southwestern Utilities	8s	1936	97	96	102
Springfield Ry. & Lt	5s	1926	99	98½	100½
St. Joseph Ry., Lt., Ht. & Pwr	5s	1937	91½	85½	92
Standard Elec. of Cal	5s	1939	98	98½	100½
Standard Gas & Elec	6s	1935	99½	91	101
Staten Island Edison	6½s	1953	104	104	106½
Syracuse Ltg	5s	1951	101	100½	103
Tampa Elec	5s	1933	h99	....	....
Tenn. Elec. Pwr	6s	1947	102½	99½	104½
Tenn. Pwr	5s	1962	93	90	96½
Tex. Pwr. & Lt	5s	1937	98	97	99½
Tex. Pwr. & Lt	6s	2022	95	90	96½
Tide Water Pwr	6s	1942	99½	98½	101
Tide Water Pwr	7s	1937	99	97½	101½
Toho Elec. Pwr. (Japan)	7s	1955	89½	87	91½
Toledo Edison	5s	1947	98	97	100
Toledo Edison	7s	1941	109½	108½	110
Toledo Gas Elec. & Htg	5s	1935	96	97½	100½
Topeka Edison	f	1930	97	97	100
Topeka Ry. & Lt	5s	1933	95½	90½	96½
Tri-City Ry. & Lt	5s	1930	98	96½	99½
Twin State Gas & Elec	5s	1953	90	84	94½
Tyrol Hydro-Elec. Pwr.	7½s	1955	96½	94½	96½
Union Elec. Lt. & Pwr	5s	1932	100	99½	102
Union Elec. Lt. & Pwr	5s	1933	100	98½	101
Union Elec. Lt. & Pwr	5s	1954	98½	97½	100
Union Elec. Lt. & Pwr	5½s	1954	100½	100	104
United Elec. of N. J	4s	1949	86½	85	88½
United Elec. Lt. & Pwr	4½s	1929	f 98½	98½	99
United Gas & Elec	6s	1945	97	96	101
United Lt. & Pwr	5½s	1959	94½	89½	97
United Lt. & Pwr	6½s	1974	94½	92½	97½
United Lt. & Rys	5s	1932	f 95	93½	97½
United Lt. & Rys	6s	1952	f 98	95½	100½
United Lt. & Rys	6s	1973	f 89	87	92
United Pwr. & Lt	6s	1944	101	99	103
Utah Lt. & Trac	5s	1944	87½	83½	91½
Utah Pwr. & Lt	5s	1944	95	91	98½
Utah Pwr. & Lt	6s	1944	102	102	104½
Utah Pwr. & Lt	6s	2022	91	88½	94½
Utica Gas & Elec	5s	1957	102	98½	103
Vermont Hydro-Elec	6s	1929	99	98½	100½
Vicksburg Lt. & Trac	5s	1932	90	89	93½
Virginian Pwr	5s	1942	94	88	96
Virginian Pwr	6½s	1954	100	99	102½
Virginia Ry. & Pwr	5s	1943	96½	93½	99
Wagner Elec. Mfg	7s	....	f 100½	100	102
Washington Coast Util	6s	1941	101	99½	101½
Washington Wtr. Pwr	5s	1939	100½	99½	101½
West Penn Pwr	5s	1963	99½	93½	99½
West Penn Pwr	5s	1946	99½	93½	100
West Penn Pwr	5½s	1953	102½	100½	105½
West Penn Pwr	7s	1946	105½	104½	107½
West. Virginia Lt., Ht. & Pwr	6s	1929	98½	95	100
West Virginia Utilities	6s	1935	96	91	98
Western Elec	5s	1944	101	98	101
Western N. Y. Utilities	5s	1946	94	90½	97
Western Pwr	6½s	1954	99½	97	100½
West. States Gas & Elec	5s	1941	97	95	99½
West. States Gas & Elec	6s	1947	98	97	100½
Westinghouse Elec. & Mfg	7s	1931	106½	103½	108½
Wisconsin Elec. Pwr	5s	1954	96½	93½	99
Wisconsin Gas & Elec	5s	1952	98	97	100½
Wis.-Minn. Lt. & Pwr	5s	1944	94	93	96½
Wis. Ry., Lt. & Pwr	5s	1933	92½	87½	93½
Wis. River Pwr	5s	1941	90	88	92½
Yadkin River Pwr	5s	1941	97½	96½	99½
Yarmouth Lt. & Pwr	5s	1937	83	82	87
Yarmouth Lt. & Pwr	8s	1951	98	97	102

Stock Exchange—Chicago; St. Louis; Philadelphia; Montreal; Baltimore; Montreal; Quebec; Seattle. Bid price, low and high, Tuesday, Sept. 8. (latest quotations available)